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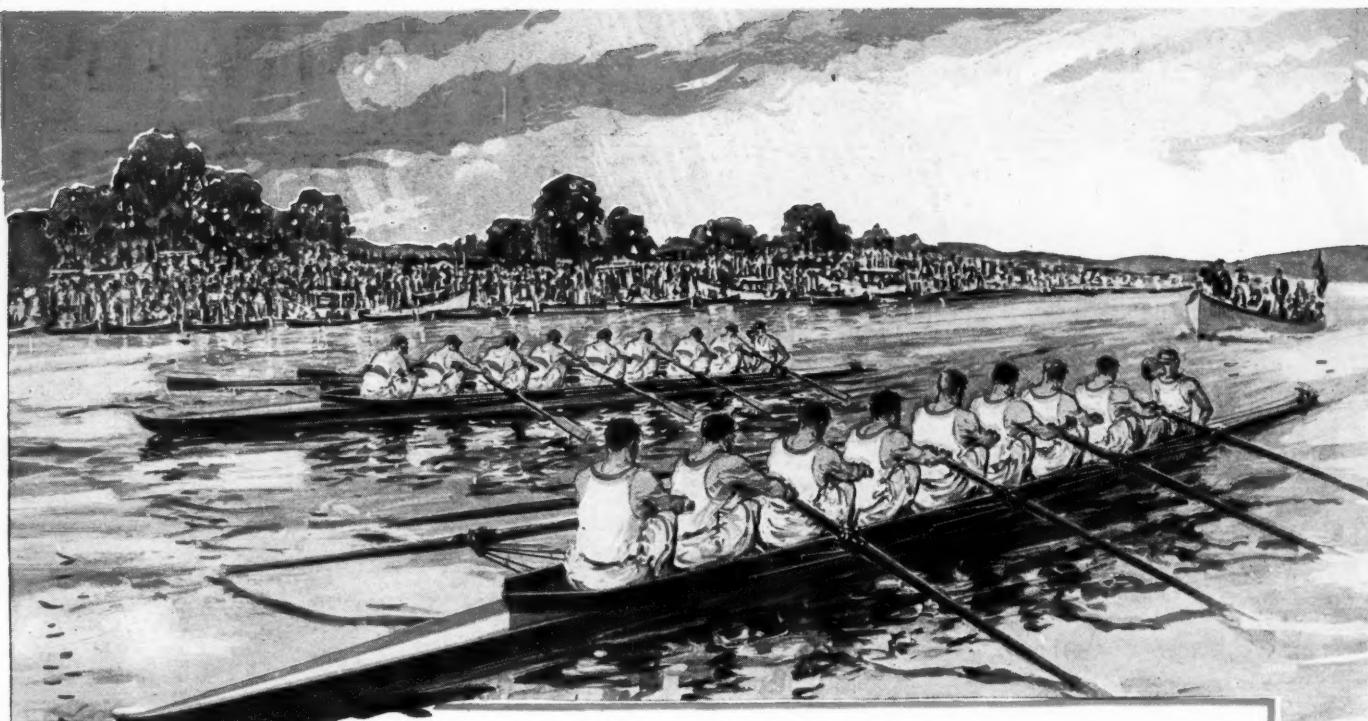
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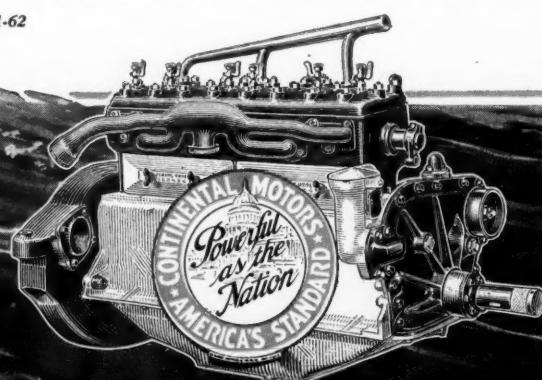
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VOL. XLVI.

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No. 1

Foreign Models Predominate at Belgian Show

The 12 Belgian makers, however, show evidence of coming back into production after the period of war depression. Little attempt has been made to get into cheap production. All-weather bodies and four-wheel brakes have been given increased attention.

By W. F. Bradley

THE last of the European series of automobile shows for this season was opened when Burgo master Adolphe Max inaugurated the Belgian fifteenth motor exhibition in the Palais du Cinquantenaire in Brussels on Dec. 4. The show was open to all but ex-enemy countries, but unlike all other exhibitions united more foreigners than natives. Belgium has only 12 makers of passenger cars, while the French industry was represented by 41, Italy by 7, America by 4 and England by 3, thus making a total of 67 in the car class. In addition to these there were 40 truck or tractor exhibitors, 20 body builders and nearly 200 accessory dealers, the total occupying 112,000 sq. ft. of exhibition space.

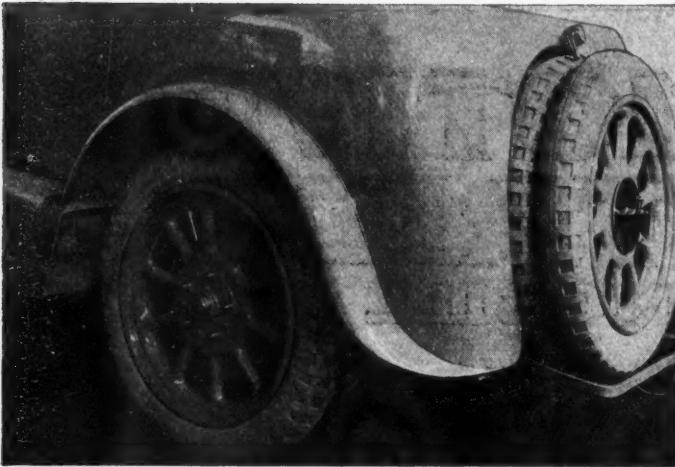
The Belgian show was open to all branches of the automobile industry, the main hall being filled with chassis and complete cars, the galleries with accessories and an annex with trucks, tractors and motorcycles. American passenger cars on exhibition were Case, Overland, Studebaker and Willys, with Cletrac, Fordson, Rainier, Titan in the tractor section and Harley-Davidson and Ace in the motorcycle class. American tire makers were well represented.

Although Belgium now has the lowest import duties in the world, namely 20 per cent ad valorem, compared with 45 per cent in France and 33 1/3 per cent

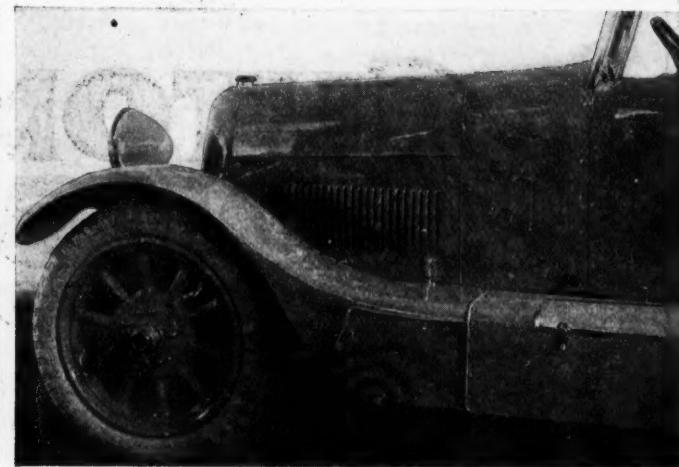
in England, it has become very difficult for American dealers to do business in that country during the past year, owing to the high value of the dollar. The greatest volume of business is being transacted by French and Italian makers. For the former the rate of exchange is at par, for the latter there is a decided advantage. During the first nine months of the present year France shipped 1653 automobiles to Belgium, compared with 561 coming from the United States and 548 from Italy. During the same period Belgium sent 82 automobiles into France and 19 to America.

The low import duty is not the only reason for the invasion of the Belgian market by foreign firms. Before the war the Belgian makers were only interested in high-grade powerful or medium powered cars, and exported about 75 per cent of their production. After rebuilding and refitting her wrecked factories, she got into production again a little more than a year ago, on the same general lines. Since then the only change has been the introduction of smaller cars to meet the demand for economy, but there has been no attempt to get into really cheap production. This state of affairs left the Belgian market open in 1919 to American firms with cheap cars, and since then France and Italy have stepped in, for America is

—V, 73.



Rear end of Fiat passenger car, showing how spare wheels are carried



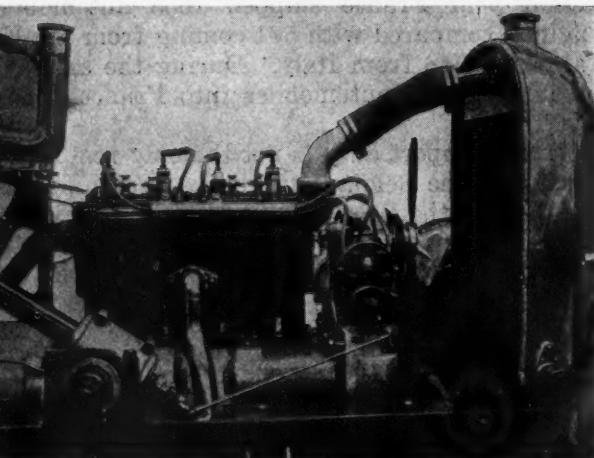
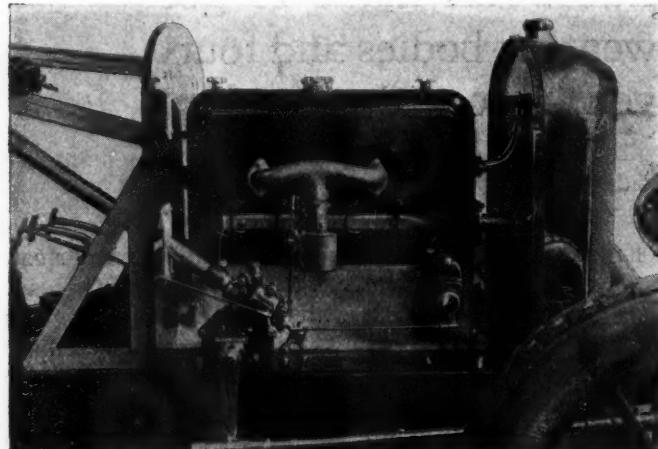
Tool and battery box in running board and fender of Fiat touring car

handicapped by exchange rates, and also to a slight extent by higher shipping costs. One explanation of the decreased American business is the excessive gas consumption of her automobiles, but this is a minor matter compared with exchange rates.

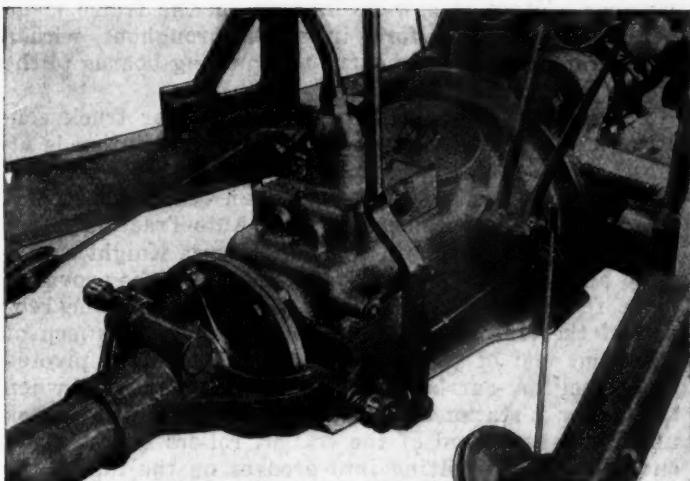
Although there is depression at the present time, statistics show that a big volume of business has been done in Belgium since that country was freed from the war. In 1914 there were 16,000 automobiles in use in Belgium; this year the number has reached 33,200, of which 12 per cent are trucks or tractors. Motorcycles have increased from 11,000 to 20,000.

As it is the practice for European makers to prepare one set of show models which are sent to Paris, London and Brussels, the last show of the season contains few technical novelties. In this instance the new types are confined to a limited number of Belgian makes which were not ready for the earlier shows. Following the general tendency toward 122 cu. in. touring models, the Nagant Company has brought out a new chassis of this class. It is a four-cylinder of 72 x 120 mm., with detachable head, overhead valves and concealed pushrods. The power plant is unit construction, with four speeds, the two levers mounted on the top of the box, but with right-hand steering. An inclosed type propeller shaft is used, with forked front end connected up to the two extremities of a forged steel member mounted on the rear end of the gearbox. The universal is a fabric type placed within the fork. One of the features of this car is the use of four-wheel brakes applied under Adex license. Under this system of braking the camshaft is mounted in the axle and control is by means of flexible steel cables used diagonally. This mounting is not only exceedingly neat, but it has the advantage of adding very little to the production costs of the car. Control is normally by pedal, this applying all four brakes simultaneously. The lever, however, gives the same control, and is only used for holding the car in a standing position. This arrangement is acceptable with diagonal control of the brakes, for if for any reason one set failed, two wheels on opposite sides would be braked and the car could be pulled up normally. Nagant expects to get into production on this job by early March.

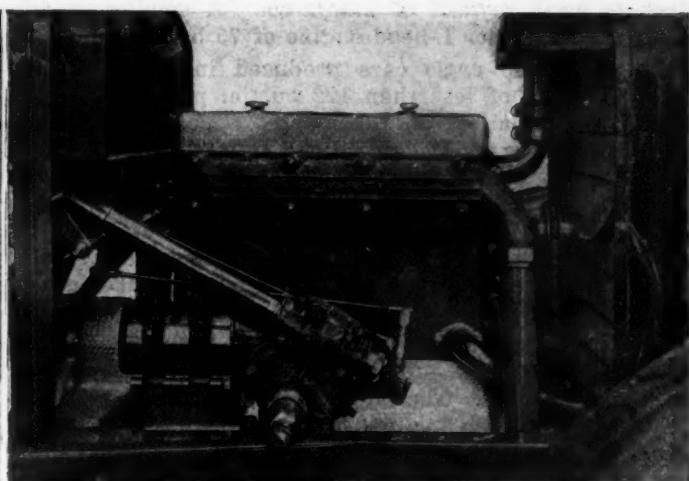
Metallurgique has also taken up the Adex system of front-wheel braking, and is applying it to one model only, a high class four-cylinder of 30 hp. The Adex patents are held by Engineer De Coninck, of the Belgian Excelsior Company, and these brakes are naturally applied to his firm's cars. One model only is produced, this being a high grade and expensive six. Imperial-Abadal of Liege, has an eight-ahead overhead valve job fitted with the Perrot system of front-wheel brakes. Miesse shows a front-wheel brake, of his own design, but has not yet applied it to his standard cars, and it appears that the brake has yet to go through its tests. Miesse uses an open jaw front axle and mounts the whole of the brake operating mechanism on the top of the jaw. This consists of a short, vertical castellated shaft, in the same axis as the king bolt, with a mushroom headed disk mounted on it. There is a cam under the disk and by its rotation the mushroom head is raised or lowered, thus opening or closing the brake shoes, the



(Above)—Dasse overhead valve engine
(Below)—Auto-Mecanique P. M., one of the few Belgian small light cars



Gearbox, universal joint and center control on Nagant 12 hp. chassis. Note four wheel brake cables



New Nagant 12 hp., 2-litre overhead valve engine

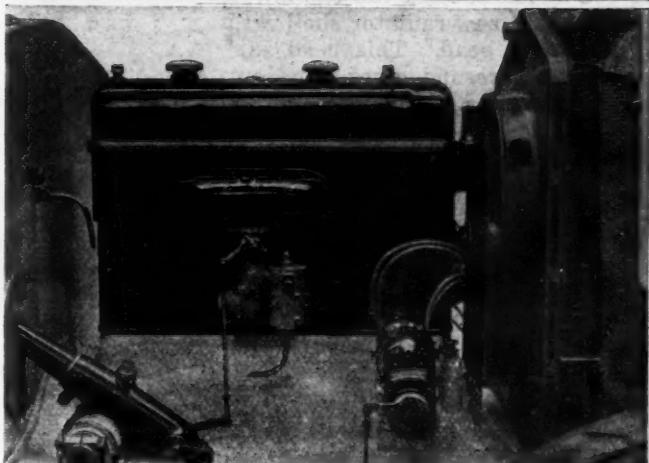
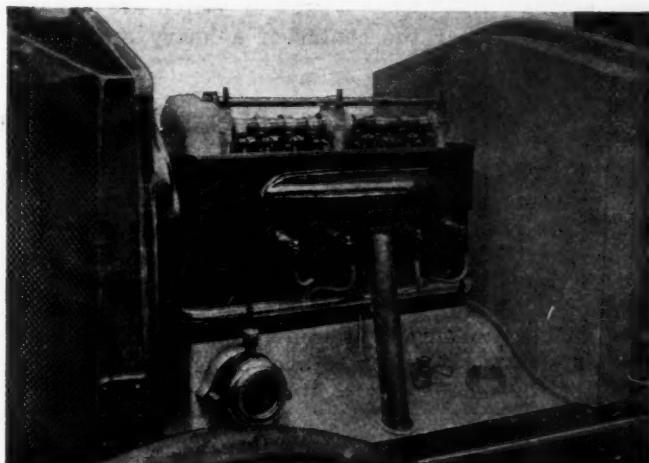
ends of which are fitted with rollers. The claims made for this design are that it avoids all flexible connections between frame and brake drum, and does not necessitate carrying the brake camshaft in the axle. All that is necessary to fit it is sufficient area on the head of the axle jaw.

A fine example of Belgian designed 2-litre engine, on a four-passenger car with a wheelbase of 118 in., is the new Somea. This has a unit powerplant, the four-cylinder engine measuring 69 by 133 mm. The head is detachable, and the overhead camshaft, carried in three plain bearings, is operated by a vertical shaft in the cylinder block, with the use of spiral bevel gears. A cross shaft in front drives magneto and fan. This is an exceptionally good example of modern, clean design, the cleanliness being obtained by the use of concealed cylinder holding down bolts, the extension of the aluminum crankcase webs right up to the frame members and the use of an aluminum dash with a close fit to the top of the crankcase. All air is thus expelled laterally, through the sides of the hood. The only openings under the hood are for the passage of the steering column and for the fan belt, which is driven off a pulley on the crankshaft. The gasoline tank is on the rear face of the aluminum dash, with the filler under the hood, the union for the gasoline feed pipe being brought through the dash, and the lever type shut-off cock placed just above it. The engine runs up to 3000 revolutions, at which speed it develops 36 hp.

The electric generator and starting motor are placed respectively to left and right of the four-speed gearbox. This mounting of the generator is rather unusual on European cars. Brake and change speed levers are not mounted on the top of the box itself, but on the cast steel end-plate which closes the box and receives the ball head of the propeller shaft housing. The practice of using center control with right-hand steering appears to be a growing one in Belgium. A detail of this car is the use of the space usually occupied by the rear gasoline tank for a tool box. This is fitted in flush with the top of the frame members, and would at first sight be mistaken for a gasoline tank. The arrangement is acceptable with a light car running 25 miles to the gallon and capable of carrying a good supply of gasoline on the dash. Although of high class the Somea is a fairly cheap production job and is being marketed at 25,000 francs (at present exchange \$1,600) with five-passenger body.

Miesse has got into production with two models, a

four and an eight-ahead, each of 69 by 130 mm., with overhead camshaft. Another new overhead camshaft job is the Dasse 30 hp. four-cylinder of 90 by 140 mm. This is a detachable head engine with vertical shaft inside the cylinder casting, and spiral-bevel gears. The fan is driven off the shaft and a cross shaft operates pump and magneto from its ends. The Dasse has an air-tight dash, but, contrary to the usual practice, the



(Above)—2-litre Somea engine with overhead valve. Note aluminum dash with air-tight joint in base-chamber

(Below)—Exceptionally neat Somea 2-litre. Gasoline tank is on rear of aluminum dash. Note gasoline feed pipe and cock just above it

dash is wood instead of aluminum. A smaller model has a four-cylinder L-head engine of 75 by 130 mm.

There are no cycle cars produced in Belgium and very few cars of less than 122 cu. in. piston displacement. The smallest on the market appears to be the Auto-Mecanique P. M., an L-head four-cylinder of 69.5 by 120 mm. This is laid out for cheap production and is one of the lowest priced cars on the Belgian market. Another cheap car is the Belga, the feature of which is a friction transmission which gives direct drive through a cone clutch on top and only a frictional point contact when running on a lower ratio.

The Pipe Company of Brussels has been one of the slowest to get into production, having just come out with its new lines. The biggest model is a four-cylinder L-head engine with inclined valve stems, of 120 by 200 mm. This is one of the biggest engines on the European market, and the practice of adopting a bore of nearly 5 in. for a four-cylinder engine is quite contrary to the general European tendency. There are two other Pipe models, with four cylinders of respectively 100 by 180 and 80 by 150 mm.

Renault showed his new models with some modifications in design, among these being changes in the radiator, which is no longer right across the frame, behind the engine, but forming a bridge over the engine, with the rear cylinder under the header tank. Wind scoops are fitted on the radiator core in order to direct the current of air into the tubes. Renault announces that on all but his smallest model he will fit diagonal cantilever springs, the forward ends of which are shackled up to a point near the center of a heavy cross frame

member. There is now no insweep on the frame members, these being uniform in width throughout, with a false frame built out to carry the running boards to the full width of the chassis.

Belgian makers have not taken up motor truck construction, consequently this part of the exhibition is almost entirely foreign. Among the new features is a Berliet 5-ton truck with worm-driven rear axle.

Among the newcomers is the Auto-Traction semi-trailer, the tractor of which has a Minerva Knight engine of 90 by 140 mm. The feature of this job is the provision made for automatically loading the trailer on the rear end of the tractor. There is a pronounced upsweep of the front end of the trailer, and under this a pivoted two-wheel fore-carriage which only carries the load when the trailer is stationary. The tractor is designed to back under the front end of the trailer, rollers on the front end of the latter fitting into grooves on the top of the tractor frame members. When in position the trailer fore-carriage is automatically tilted upward and backward so that its wheels are quite clear of the ground, and are tucked between the rear end of the tractor frame members. A load of 7 tons is carried on the trailer.

In the body section the feature was the attention given to all-weather bodies. These have been particularly developed by d'Ieteren, one of the leading Belgian builders. The Minerva company, now having its own body department, is also making a specialty of all-weather bodies built under the Gwynne patents. The demand for a body of this type, which gives an open car in summer and a completely closed car in winter, the change from one to the other being made in less than a minute, is becoming strong.

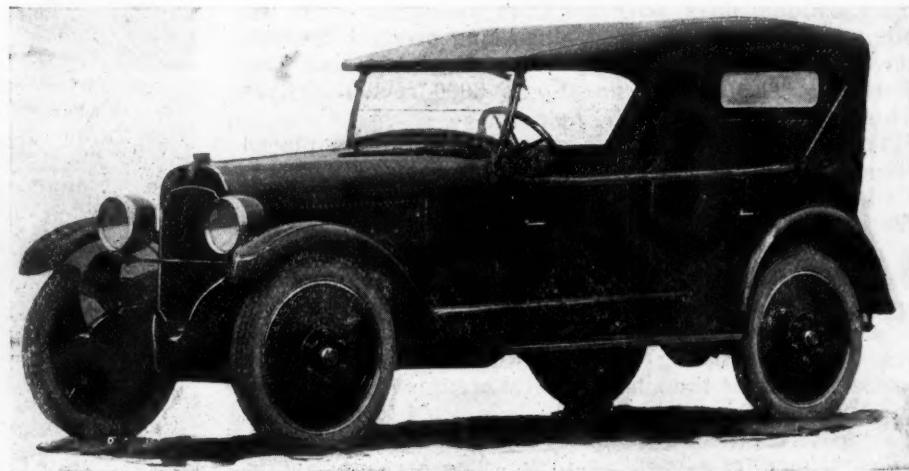
New Chalmers Body Models

A NUMBER of refinements in the body finish and appearance have been made in the Chalmers cars for 1922. The chassis remains unchanged. A new type of fender has been adopted which has a deeper crown and which is made from heavier gage stock. The new fender follows the contour of the wheel closer than the former style, giving a materially altered appearance. Drum type headlamps have been adopted and, on enclosed cars, cowl lamps of the same pattern are also fitted.

Another material factor in altering the appearance of the car is the adoption of a new radiator shell with an aluminum bead. This bead surrounds the core and gives the front end of the car a distinctive appearance. Disk wheels are now fitted as standard equipment, and these, in connection with a lower top, accentuate the long lines of the car. Carrying out the low effect, there is now a one-piece windshield in place of the two-piece type formerly employed. In the construction of the top, all of the seams have been made water tight and there are no exposed bows, one bow having been eliminated in the new model. The tool kit is now in the left front door on all models and the side curtains are carried in flat pockets outside of the regular door pocket.

One of the refinements in the finish of the body is the addition of a dull finish molding strip around the top edge. Kick pads and foot pads are placed on the apron and running boards, and on the roadster there is a trap

door in the deck. For more accessible control, the starter has been placed between the clutch and brake pedal, and the dash layout has been rearranged to secure greater accessibility of the instruments. The body hardware has been entirely revamped, even to the hub caps, which are now of new design carrying the initials of the Chalmers Motor Co., and the door handles which are of the exposed type.



New series Chalmers Six five-passenger touring car, showing standard equipment

Prices of the car are for the Model C roadster, \$1,245; C, five-passenger touring car, \$1,295; C, coupe, \$1,995; C, sedan, \$2,295, and B, seven-passenger touring, \$1,395. The sport model has been discontinued, as it is practically duplicated in the present five-passenger model.

New Four-Cylinder Car Has Brakes on All Wheels

Frontenac is designed along racing car lines with 197 cu. in. engine and foot operated four-wheel brakes. Chain-driven overhead camshaft and location of electrical units alongside the gearset gives a clean appearing powerplant. Open cars are expected to sell for less than \$2,500.

By J. Edward Schipper

THE new Frontenac, which incorporates a great many unique features of design, is now being made ready for production. The car was designed by Louis Chevrolet and C. W. Van Ranst, who has been associated with Chevrolet on the racing cars. It is of original design throughout, incorporating an overhead camshaft engine, four-wheel brakes and many other departures from usual practice. In spite of this, the designers claim that the car will be in the \$2,000 class when it is put on a production basis, which, they state, will be early in the spring of 1922.

The engine is a 3 3/8 by 5 1/2-in., four-cylinder, block cast. The cylinder head is cast separately from the block and the crankcase is also a separate aluminum casting with a pressed steel bottom pan. The clutch and gearset are mounted on the engine, forming a unit powerplant.

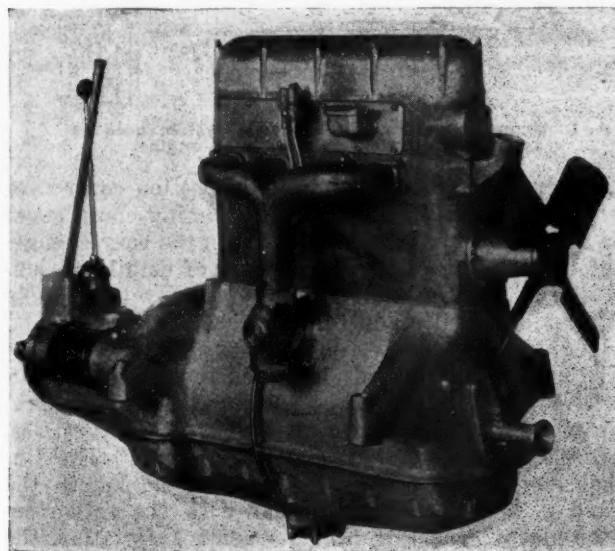
The piston material has not as yet been decided upon, but it will probably be an aluminum alloy. The piston length is 4 1/4 in., and the design incorporates the Nelson patent features, having an expander in the form of a double ended bolt which determines the piston clearance in a plane at right angles to the piston pin. The piston is turned round to .008 in. clearance in the cylinder wall and then expanded .0025 in. by the expander. When heated, the piston is said to expand only in the plane of the piston pin and to return to the normal round shape.

I-beam connecting rods with 11 in. center distance are employed. The crankshaft has three bearings with 2 1/8, 2 3/16 and 2 1/4 in. diameter at front, center and rear, re-

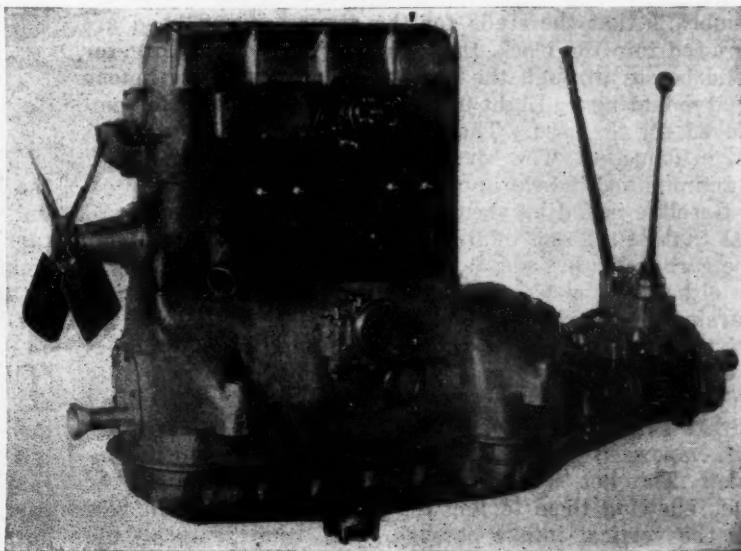
spectively. The lengths of the bearings are, respectively, 3, 2 1/2 and 3 7/8 in., front to rear. The crankshaft is a plain disk type, the end thrust being taken by the center bearing; .005 in. end play is allowed in the crankshaft.

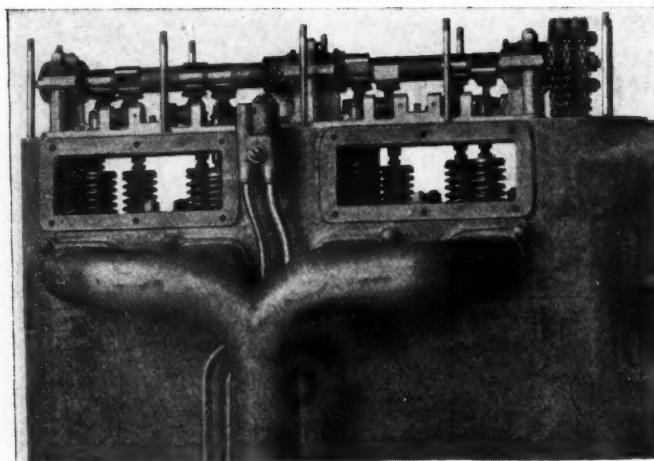
One of the interesting features of the Frontenac engine is the method of driving the camshaft. This is by means of two chains through a relay idler, permitting the reduction to be stepped up and, consequently, reducing the sprocket size. The chain employed is the Link-Belt, unit type, with a spring idler take-up. The overhead cam-shaft is hollow and mounted in three bearings. The cams are pierced with oil holes at the point of commencement of the lift. The camshaft chamber is oil tight and separated from the valve chamber. The valve action is by rocker arm to an adjustable tappet which operates through an oil tight bushing. The rocker arm is a very light forging, hardened and ground on the bearing surface. The bushing guide is of cast iron. The tappets are hollow steel and the valves seat directly in the head. Both the inlet and exhaust valves are of the same size, although the materials differ, high tungsten being used for exhaust and low tungsten for inlet. The valves are 1 7/8 in. clear diameter and have a lift of 3/8 in. from a 30 deg. seat. The stem diameter is 3/8 in. The valves are so timed that the exhaust opens 45 deg. before lower dead center, closes at 10 deg. after upper center and the intake opens 10 deg. past upper center and closes at 40 deg. past lower center.

Lubrication is by high pressure system, normal pressure being 50 lb. Leads are carried to the three main bearings



1—Right side of engine used in the Frontenac car showing exhaust manifold. End of cone is shown at bottom of manifold. 2—Carburetor and intake side of new Frontenac engine





3—Camshaft and valve chamber on new Frontenac. The overhead camshaft mounting structure is of diecast aluminum

and from these to the connecting rod bearings. The oil is led under reduced pressure to the camshaft, the leads passing to the center camshaft bearing, where the oil flows through a small hole, which has the effect of reducing the pressure. There is a regulating valve equipped with a check to keep the oil pump full of oil, and a by-pass for oil pumped in excess of requirements.

Cooling water is circulated by thermo-syphon action. A four-blade fan is mounted on the shaft which carries the relay sprocket for the camshaft drive chain. The water passages are large, none being less than $\frac{3}{8}$ in. in the coring at any point. The spark plugs are mounted in the side of the cylinder block and are completely surrounded by water.

Ignition is by the Delco system and both automatic and manual advance are furnished. The generator drive is on the rear end of the gearset, the chain being driven from the rear end of the main shaft, thus it only is in operation when the car is under way. This allows the engine to accelerate suddenly without danger of stripping the generator drive gears. The starting motor balances the generator on the other side of the transmission gearset, leaving the engine clear and also giving a distribution of weight toward the center of the car. Bendix drive and shift is employed on the starter. Another advantage resulting from this location of the generator and starting motor is a decreased length of wiring.

An interesting point in connection with the engine assembly is that the studs for the crankcase and head are screwed into the block, thus eliminating the necessity for solid bosses through the block to take care of continuous stud mountings. Eight $9/16$ in. nickel steel studs are employed for the case. There are thirteen head studs $7/16$ in. in diameter. The cover of the valve mechanism is of aluminum and is held in place by ten cap screws.

Gasoline is fed by vacuum to the carburetor from a 20 gal. tank at the rear of the chassis. The make and size of the carburetor has not as yet been determined, but it will be either $1\frac{1}{2}$ or $1\frac{3}{4}$ in., taking in all cold air. The carburetor is a horizontal type with vertical flange and the mixture is led through a transverse pipe directly across the block between the two middle cylinders to the opposite side where the heavier fuel particles come into contact with a heated cone which is in contact with the exhaust. The vaporized portions of fuel pass upwards into the intake. The hot cone vaporizes the heavier particles of fuel, allowing them to join the in-going gases which flow up the vertical intake passage. The cone being on the right side of the engine is in the path of any liquid fuel which drains to that side, due to traveling with the left

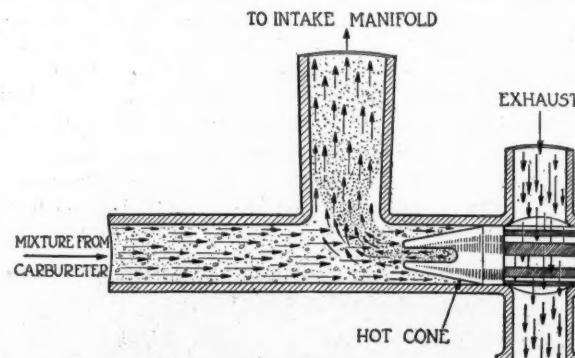
wheel on the crown of the road. The cone is shown diagrammatically in the sketch herewith.

The clutch is a single, dry plate type which will be bought outside, and the gearset is a three-speed type with a double bearing on the rear end of the main shaft to take the generator drive stresses. The halves of the double bearing are placed about 3 in. apart. One of the features of the transmission gearset is the large oil filler which is located in the front valve cover.

Propulsion is by means of a hollow shaft with two universals. The rear axle is of Frontenac design with spiral bevel gear. It is a $\frac{3}{4}$ floating type with a ratio which will probably be about $4\frac{1}{2}$ to 1. The pinion shaft has a bearing on each side of the pinion and the axle construction is very similar to those used on the Frontenac racing cars. The front axle is an I-beam section and is of the inverted Elliot type. The wheels are equipped with 32 by 4-in. tires.

Four-wheel brakes are employed for the service layout and a brake on the rear end of the transmission is employed for the emergency. The four service brakes are all internal expanding shoe type operated by cams. As is usual with four-wheel brakes, the king pins in the front axle are inclined so that if produced they would intersect the ground at the point of contact of tire and road. The four-wheel brake cams are mechanically operated. The hand brake is a metal-to-metal internal expanding type. The emergency brake ratchet is cast in the cover of the transmission and is so arranged that when the brake is applied it cannot be jammed on so hard as to make it very difficult to release. The lever has direct action to the brake cam piece without exposed parts.

The frame is of deep section pressed steel with the front springs outside of the frame, as in the Frontenac racer. The springs are semi-elliptic, front and rear. A full line of bodies will be provided, the open cars to sell for less than \$2500. The cars are replete with detail features of interest, such, for instance, as the location of



4—Diagrammatic sketch of hot cone system used to assist vaporization on Frontenac engine

the breather, which is in the front inspection cover over the valve mechanism. The front end timing chain cover carries a funnel-shaped guide to assist in the easy engagement of the starting crank. A number of details are unsettled at this writing and the final design will probably not be complete until ready for production.

THE Bureau of Standards has been invited to take an active part in organizing and executing a comprehensive series of investigations relating to the properties, testing, and standardization of molding sands. The Bureau has done considerable work on this subject in the past, and it is to be expected that with the active cooperation of the American Foundrymen's Association, the National Research Council, and others, considerable progress will be made in this important subject.

Continental Manufacturers Turn to Light Cars

High taxes and high cost of fuel causing French makers to build machines of from 10 to 12 hp. Some jobs may be strong competitors of light built American cars in foreign markets. Prices range from 8,500 francs for two-seater to 95,000 francs for car de luxe. Four wheel brakes a feature.

By W. F. Bradley

THROUGHOUT Europe generally the public is calling for cars which are cheaper to purchase and maintain. As a consequence all manufacturers have put on the market a four-passenger car of nominally 10 to 12 hp. These have four-cylinder engines varying in bore from 60 to 75 mm. (2.3 to 2.9 in.) and generally have a wheelbase from 100 to 120 in., with a 48 to 54 in. track. The only counterparts of the American type cheap production car with comparatively big engine are the Berliet, with a cheap four-cylinder of 3.5 to 5.1 in. bore and stroke; the Lorraine-Dietrich, with an overhead valve six, and the Bellanger, which is assembled in France with parts imported from Detroit.

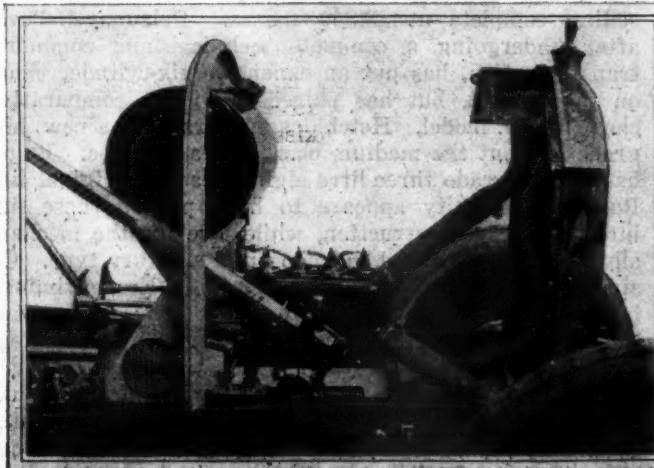
All the other makers offer cars with smaller engines, 120 cu. in. generally being the maximum piston displacement. They are all four-passenger types, for some of them have a narrower track than the standard 56 in. These 10 to 12 hp. cars are more economical to maintain in Europe than the American types, for they pay less in taxation and have a lower gas consumption. Their makers claim to be able to meet American competition on foreign markets by reason of a higher quality of finish and a lower cost of maintenance, which will offset the greater initial cost.

While there is uniformity in piston displacement there is a wide diversity in design and in production and selling costs. Citroen still markets the cheapest four-passenger car on the French market, his latest cut having brought the price down to 13,900 francs (this amount includes the state 10 per cent luxury tax), or at present exchange \$993. A car of this type kills all American competition on the

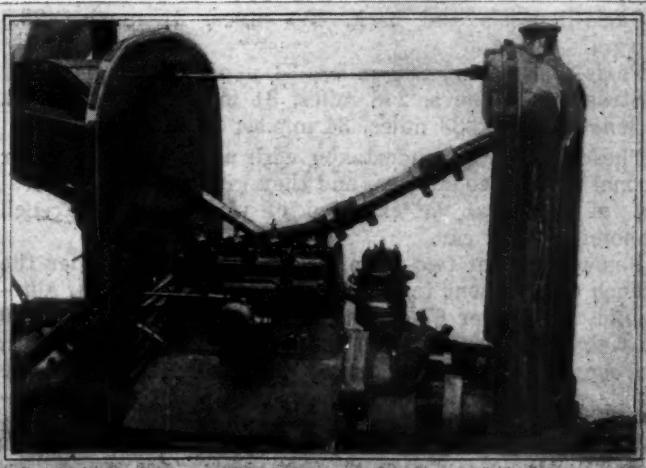
French market, where, however, conditions are artificial by reason of exchange rates and a high import duty. Even in other countries, where exchange rates are more normal, and import duties do not play the same importance, this and other cheap French cars offer real competition to the cheaper American types. Renault is listing his cheap production four-passenger four-cylinder 10 hp. car at 19,000 francs.

Fiat has a car of similar size and power, but of higher finish, which has just been reduced on the French market to 21,500 francs. Talbot-Darracq has come into this class with a cheap production 10 hp. overhead engine, four or five-passenger body, 48 in. track, 118 in. wheelbase, which is being marketed at 22,000 francs, complete. In the bigger class comes Lorraine-Dietrich with a six-cylinder six-passenger selling at 28,750 francs, complete. These few examples are cars not only of local importance, but which will figure on international markets.

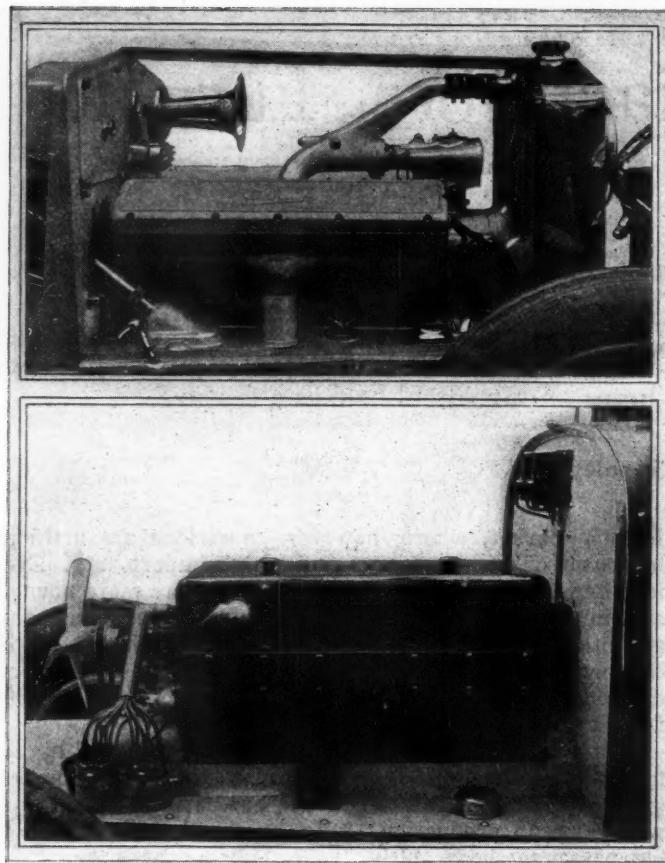
Apart from these cheap production models, there is a big series of 10 to 12 hp. cars not comparable with anything produced in America, for they have a finish and a quality which in the United States is nearly always associated with costly cars. Delage, whose original program was a high grade six, has put forth an 11 hp. four-cylinder with front wheel brakes which, while of high quality, has been closely studied with a view to low production costs and is selling at 26,900 francs with six-passenger open body. Delaunay-Belleville, a firm formerly associated with big, costly cars only, now has a modern 10 hp. chassis with a four-cylinder engine of 72 by 120 mm. bore and stroke. Panhard-Levassor has stepped into a smaller car



Mathis cyclecar



Citroen big production light 2-seater with 5-hp. engine and Delco Ignition



(Above)—Fiat 12-cylinder overhead valve engine
(Below) Voisin all aluminum Knight type 12-cylinder

class with a four-cylinder Knight of only 60 by 105 mm. bore and stroke. Voisin, another firm having established a reputation with big, high-grade cars, has come into the cheaper car class with a four-cylinder sleeve valve engine on the Knight principle, although not built under Knight patents, of 60 by 110 mm. bore and stroke. These cars primarily meet French requirements; they are also very suitable for most other European countries, and it remains to be seen if they can compete with American types on more distant markets. To prove that these small engined cars can be used satisfactorily for long distance touring, Delage carried out a series of long-distance daily demonstration runs during the last half of September with the following results:

Paris-Cherbourg and back, 540 miles, 33 m.p.h.; 23 m.p.gal.

Paris-Brussels and back, 450 miles, 21 m.p.h.; 23.8 m.p.gal.

Paris-Strasbourg, 289 miles, 34 m.p.h.; 22 m.p.gal.

Strasbourg-Geneva, 248 miles, 31 m.p.h.; 21.4 m.p.gal.

Geneva-Paris, 333 miles, 34 m.p.h.; 23 m.p.gal.

These runs were undertaken with a stock model under normal touring conditions, and they give a general indication of what can be expected of this class of French economical light car.

Below the light two-seater is the cycle car. Under the French Government tax regulations a cyclecar is an automobile of not over 67 cu. in. piston displacement and 770 lb. weight. There are no mechanical restrictions, with the consequence that many of these machines are only standard automobiles in miniature, with nothing in common with the original type of cyclecar developed from the motorcycle.

Citroen has not officially entered the cyclecar field, for his 5 hp. two-seater, with a four-cylinder 55 by 90 mm. engine, fits the piston displacement rule, but its weight

lifts it out of the cyclecar into the light car class. Citroen is marketing this car at 8500 francs, complete, with lighting and starting, spare wheel and spare tire, and two-seater open body. In order not to interfere with the production of his 10 hp. car, the Bayard-Clement factory has been purchased for the construction of this new model. The importance of this move is that Citroen has got down to a price which is comparable with that of the cyclecars built by comparatively unknown firms and he possesses a commercial organization second to none in Europe. Production on a big scale will not begin for several months, but it is understood that as soon as the car is ready a big advertising campaign will be undertaken and for the first time in France sales will be made on the installment plan.

The Salmson Aviation Motor Co., one of the biggest firms of its kind in France, has put into production a light two-seater which complies with the official definition of a cyclecar, and which, like the new Citroen, has all the standard features of a full sized automobile, the selling price of which is 8,900 francs. There is thus the anomaly of a car which is not officially accepted as a cyclecar selling at a lower price than an officially accepted cyclecar. Mathis has also put on the market a little two-seater fitting the cyclecar definition, which is sold at 8,900 francs. These three types have water cooled four-cylinder engines, three-speed transmission, and shaft drive.

In contradistinction to the small and cheap cars, a number of very high-class and costly models are being produced. In not a single case are these luxury types intended to replace a cheaper model, for while no firms have abandoned a cheap model in favor of an expensive one, there are numerous examples of costly cars being dropped in favor of cheap ones. The idea seems to have been to round off a well-proportioned series by a limited production of a high grade model.

Fiat has produced a Super-Fiat which, with a chassis price of 95,000 francs, is probably the most expensive automobile manufactured on the Continent. Fiat, however, has been on the market for two years with three types of cars calculated to meet general requirements, and it is stated that the Super-Fiat will be produced in very limited quantities. It is a twelve-cylinder of 85 by 100 mm. bore and stroke, rated at 40 to 60 hp., but really developing more than twice the higher figure.

Gabriel Voisin has also produced a high-grade twelve-cylinder, intended to be a limited production job, but at the same time the firm has put out a 10 hp. light car selling at 23,000 francs. Panhard has a new 60,000 franc chassis with an eight-ahead Knight engine, which will come in direct competition with the six-cylinder Hispano-Suiza, but here again the firm has added a 10 hp. car selling complete at 23,800 francs. Delaunay-Belleville, after undergoing a complete technical and commercial transformation, has put an expensive six-cylinder chassis on the market, but has paired it with a comparatively cheap 10 hp. model. Hotchkiss appears with a new, high-grade six, but the medium class car is retained. Bugatti has a high-grade three-litre eight-ahead on original lines. Business necessity appears to have pushed these firms into cheap car construction, while love for the mechanically perfect has caused them to build a luxury type. Considered as a whole, the program of the French industry is very much more healthy than in 1919; not only are there fewer "irrespective of price" cars, but no maker is attempting to operate exclusively on this class of car.

Undoubtedly the outstanding mechanical development of recent years is the use of front wheel brakes. Thirty-seven makers have taken up braking on all four wheels either for some of their models, or in certain cases for all of them.

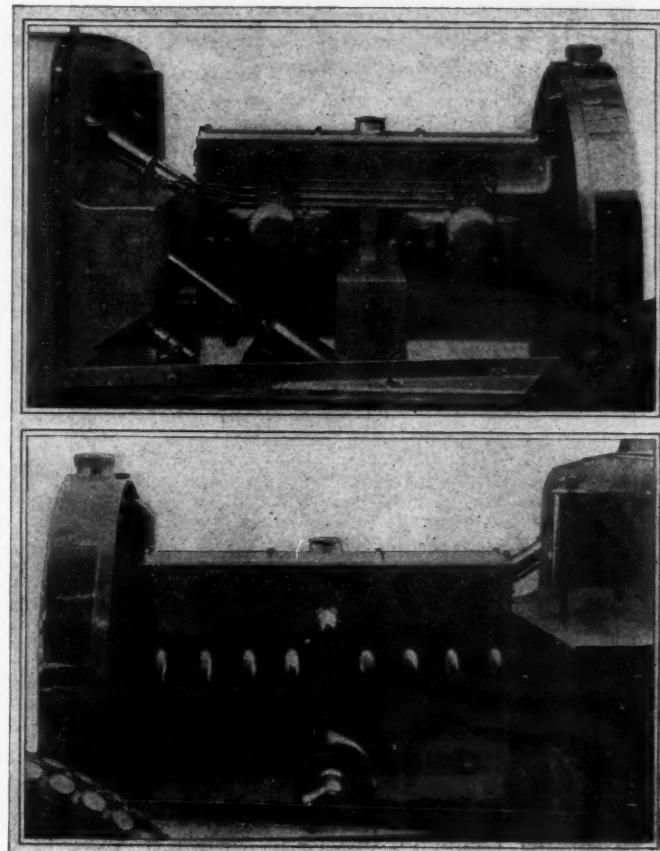
Front wheel brakes have gained the confidence of the

French public by the way in which they have been introduced. Used first of all on racing cars, they gave entire satisfaction, and the public was given conclusive demonstrations of their ability to stop a car rapidly and safely. Later they were used on a few very high-grade cars, such as Delage and Hispano-Suiza and, having been built with extreme care, the public was further convinced of their safety. Experimental work has been long and often costly, but no inefficient or unsatisfactory type of brake ever having been put on the market, users never have been able to raise any objections against this system of braking, and the general impression now is so good that the public is asking for front wheel brakes whatever the price of the car.

The latest development in this connection is the use of the servo-brake by which the momentum of the car is employed to bring it to a standstill. Hispano-Suiza was the first to use a servo-brake on a stock car; Ballot has used one on his racing models. Panhard is now fitting a servo-brake on the recently produced eight cylinder-in-line. The Hallot servo-brake has been taken up under license by Chenard-Walcker, Bignan and others.

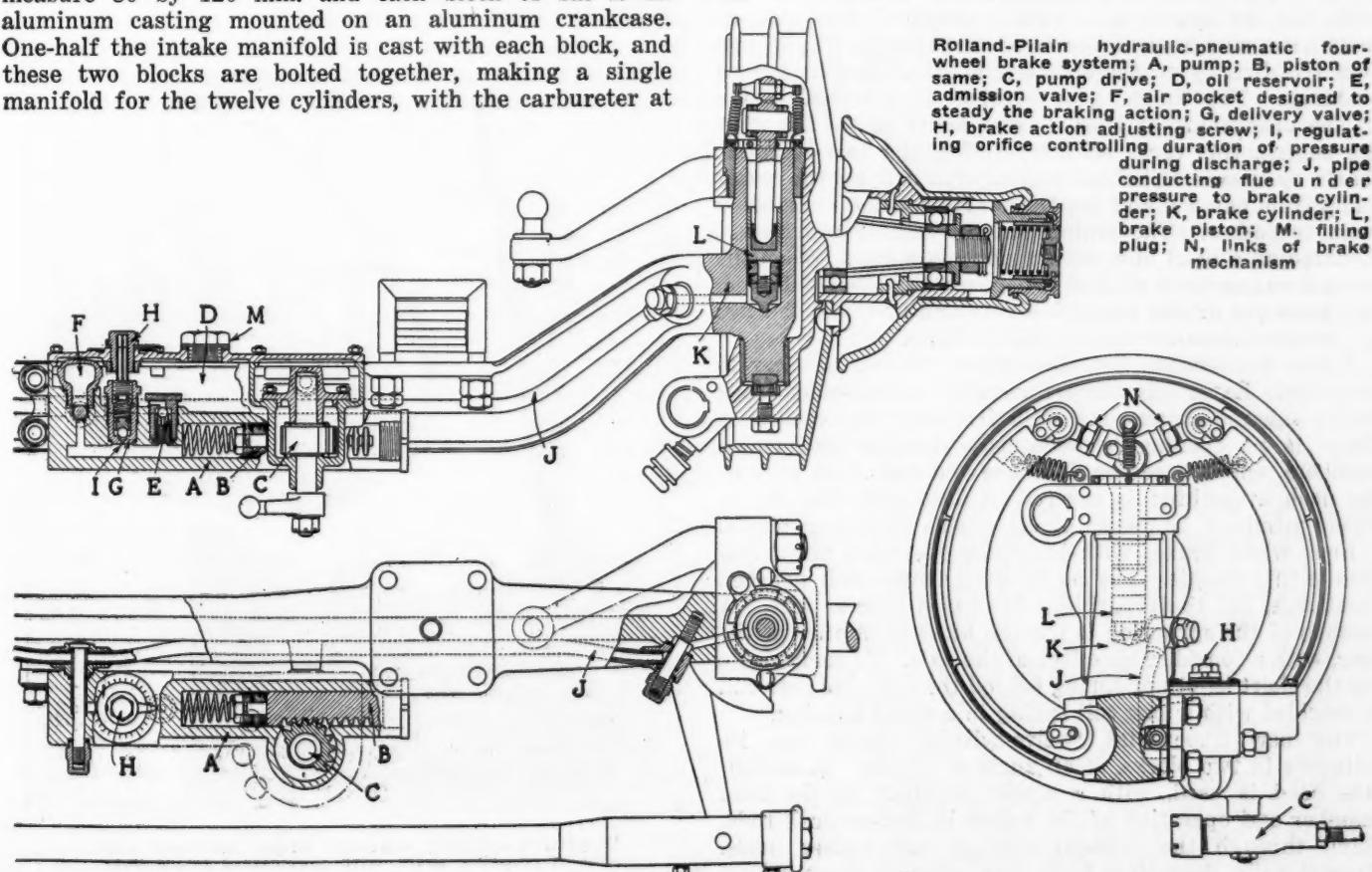
Rolland-Pilain has a very original type of hydraulic-pneumatic brake, claimed to be protected by master patents. This firm maintained that the braking system used on the Duesenberg racing cars in the French Grand Prix was an infringement of their patents and consequently obtained an official injunction against them. One of the features of the Rolland-Pilain system is the combination of the pneumatic with the hydraulic system, thus avoiding the shocks of the hydraulic brake, and allowing of an adjustment which prevents the blocking of the road wheels. The details of this braking system are shown in the drawing below.

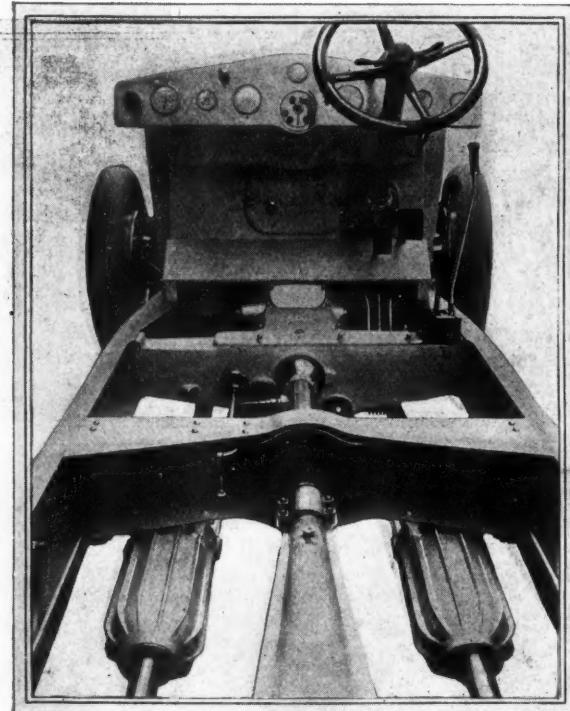
The new high-grade cars are all distinctive in design and execution. The twelve-cylinder Voisin is a Knight type, but not built under Knight license; its cylinders measure 80 by 120 mm. and each block of six is an aluminum casting mounted on an aluminum crankcase. One-half the intake manifold is cast with each block, and these two blocks are bolted together, making a single manifold for the twelve cylinders, with the carburetor at



(Above) Bugatti 183 cu. in. straight eight. Magneto is in square box
(Below) Bugatti 183 cu. in. straight eight

the rear projecting through the aluminum dash. This gives accessibility to the carburetor, which is at the





Chassis of the new 12-cylinder Super-Fiat

driver's feet, but hidden by a quick detachable aluminum plate. To overcome any porosity in the aluminum cylinder block, the inside of the water jacket is enamelled under pressure and baked. The intake manifold is treated in the same way to assure a perfectly smooth surface.

The crankshaft, which has a minimum diameter of 2.16 in., is in two parts, keyed and bolted together, and is carried in three roller bearings, with a ball thrust bearing at the rear. Auxiliary connecting rods are dispensed with, for the sleeves each have a couple of lugs cast on their base, with their inner faces turned cylindrically and mounted directly on the eccentric shaft with split bronze bushings. The timing gear consists of a helical pinion on the crankshaft driving a cross shaft at the front of the engine, this cross shaft operating the two eccentric shafts by means of helical gearing and driving the water pump from one end and the Delco high-tension distributor from the other. The pinions on the eccentric shaft are mounted on a fixed hub, with a slot and a bolt. When the correct engagement of the two gears has been obtained, two holes are drilled through pinion and hub, and the two are secured together by a couple of bolts.

Voisin has pushed the all-enclosed idea on this car to extremes. Externally the cylinders are a slab-sided block with a squared exhaust manifold dropping from each side. There is no opening between base chamber and frame members, nor between engine base and dash, and back of the dash everything is covered in flush with the top of frame members by means of detachable aluminum plates.

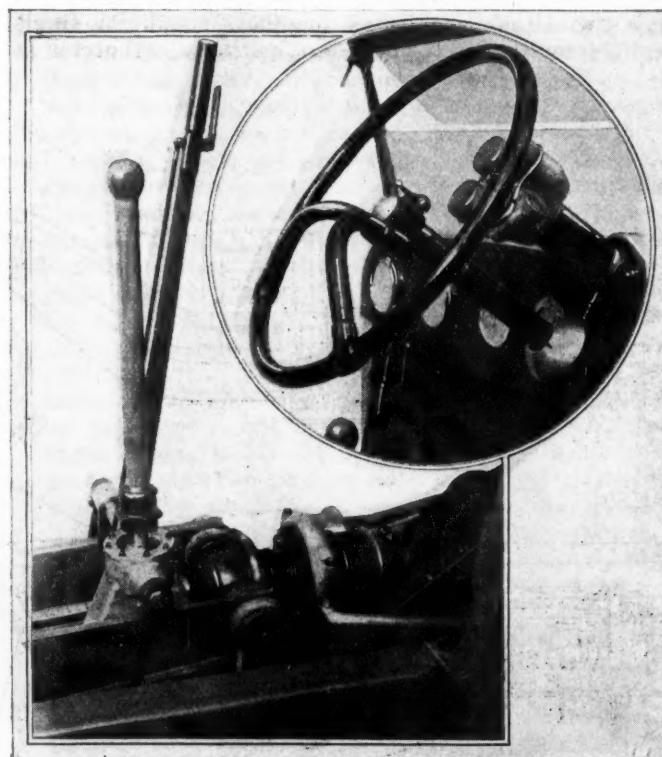
Four wheel brakes with hydraulic operation are a feature of this chassis. The car is being shown with a forged front axle, but the production job has a tubular axle. A feature of the springing is the use of semi-elliptics at the rear, with a considerable offset of the axle. To compensate for the short length of spring behind the axle, the rear end is shackled with a long coil spring in a metal housing.

The new Super-Fiat twelve-cylinder model has its cylinders in two blocks, at an angle of 60 deg. A detachable head is used, with a single camshaft in the base chamber and operation of the valves by hollow push rods, going through the cylinder casting, and rocker arms. Exceptionally clean lines have been secured; there are no

external rods or wires, and the only visible moving part is the gear driven fan. The exhausts are on the outside of the cylinder blocks, the lead being dropped down from the center and surrounded by an aluminum casing. In the Vee the engineers have lodged the electric generator and the water pump, and hidden them from view by a close fitting aluminum plate. The intake manifold arrangement is original, for it is cast with the aluminum water outlet pipe from the two blocks of cylinders, and the single carburetor is bolted up to the water outlet, with the main air intake just to the rear of the radiator. A cross shaft at the front of the engine drives the two high-tension distributors, for this car is fitted with generator battery ignition of Fiat's own design.

Gasoline is under pressure in a rear tank, the initial supply being obtained by an air pump automatically put into operation when the starting motor begins to turn. A thermostat is fitted on the cooling system, and the aluminum fan is direct driven through a flexible coupling. No electric wiring is visible, for aluminum covers have been used everywhere. An unusual position for the storage battery is in an aluminum box on the dash.

Three forward speeds and reverse are used on this car. It is claimed that it is impossible for any person to tell, by sound, whether the car is running on its direct or its first indirect gear. Rear axle construction is the same as on other Fiat models, but with the drive transmitted through a heavy central cross frame member. Rear springing is distinctive: A very long cantilever is mounted directly under the frame members, the main leaf of each spring being shackled to an oscillating spring pad on the axle housing, this being automatically lubricated from the interior of the housing. The second leaf of the spring is nearly twice the length of the main leaf, and is extended rearwards and attached by means of rollers to the extremity of the frame member. This leaf has two different cambers, and thus tends to eliminate rebound, while also giving lateral stability to the rear end of the chassis. Brakes are fitted on all the wheels.



Bugatti 8-cylinder, showing torque members each side of propeller shaft, with compressed fabric links.
(Upper corner) Bugatti 2-spoke steering wheel

Bugatti's 183 cu. in. eight ahead is another original job. The cylinders, measuring 69 by 100 mm., are in two castings, but having a common water jacket and a one piece overhead valve gear cover, the appearance is that of a block casting. There are three vertical valves in the head, with overhead camshaft, having centrally placed vertical shaft drive. From its base this shaft drives the water pump on one side and the magneto on the opposite side. There is a plain bearing between each pair of adjacent cylinders, and an additional bearing outside the clutch shaft. This is obtained by the use of an open clutch housing bolted to the rear face of the engine base chamber. The engine develops 90 hp. at 3400 r.p.m.

Bugatti uses only two speeds and reverse, it being claimed that this is quite sufficient with an engine of this power in an exceptionally low-weight chassis. The indirect and the reverse gears are contained in the combined differential and gearbox housing on the rear axle. Axle tubes are machined from the solid steel billets and the central housing is of aluminum. On each side of the propeller shaft there is a channel section torque member, with hardwood filling bolted to the differential housing at the rear and attached at the front to the extended engine base chamber

by compressed fabric links. The change speed and the brake levers are mounted on one of these members. Bugatti's distinctive type of quarter elliptic spring with the thick end rearwards is used on this chassis in conjunction with a shock absorber, the friction drum of which is inside the brake drum. Hydraulic brakes are fitted to all four wheels, and are supplemented by a hand control.

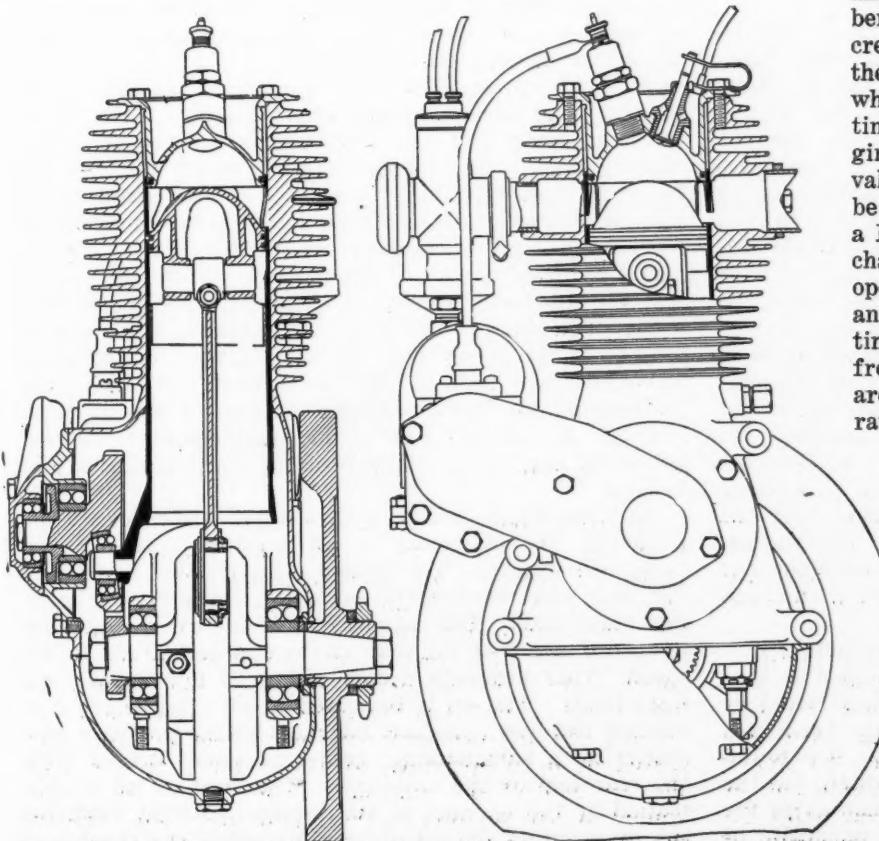
There is a very unusual use of compressed fabric in the steering gear connections. At the base of the steering column there is a fabric coupling of the type commonly employed on drive shafts. The transverse steering tie bar is formed of two steel tubes, with oval shaped ends formed of compressed fabric about $\frac{1}{2}$ in. in thickness, held between steel plates. The pivots operate direct in this fabric. The fore and aft steering rod is also made of two steel tubes, connection from this rod to the steering knuckle being by a universal with compressed leather bushings. The steering wheel has only two spokes, to allow the hand to be passed through in order to reach the carburetor controls which are on a separate column, secured to the aluminum dash. These steering connections assure flexibility with rigidity, absorb vibration and road shocks and require no lubrication.

Sleeve Valve Type of Motorcycle Engine

A MOTORCYCLE engine having a single-sleeve valve of the Burt-McCullum type is now being used on a British make of motorcycle, and it is understood that it is being subjected to tests by a well-known American motorcycle firm. Double-row, self-aligning ball bearings are used throughout, except on the crankpin, which is fitted with roller bearings. The crankshaft is a single-piece forging provided with bolted-on counterweights. The valve sleeve is given a combined reciprocating and rocking motion by means of a ball bearing of the self-

aligning type mounted eccentrically in a half-speed gear. Evidently the inner race of this bearing is mounted so it can slide on its stud, and the axes of the two races are angularly movable relative to each other.

In an engine of this design the ports require a considerable depth of combustion chamber side wall, and in order to obtain this without getting the compression space too large the piston head is crowned, as shown. This is a rather unfortunate requirement, for it can easily be seen that if the piston were cupped the same amount as it is crowned, the combustion chamber would be nearly doubled without any increase in the cooling area; that is, figuring on the same compression, the total cooling area to which the burning gases are exposed at the time of ignition need be no greater in an engine nearly twice the size. There is a small air valve in the cylinder head which can evidently be controlled from the handlebar by means of a Bowden wire. This permits of diluting the charge at will and, by closing the throttle and opening the air valve, to coast without drawing any charge through the engine and at the same time cool the engine by scavenging it with fresh air. Cylinder and top half of crankcase are in one casting, and the whole design is rather neat and compact.



Motorcycle engine with Burt-McCullum single sleeve valve

TESTS of fuel tanks entered for the Air Ministry competition for safety tanks for aircraft commenced at the Royal Aircraft Establishment on Dec. 5. The object of the competition, for which prizes amounting to £2,000 are being offered, is to obtain a tank that will withstand the shock to which it may be subjected in an airplane crash without either bursting or leaking, and thus eliminate almost entirely the possibility of fire in such circumstances, and will also withstand the effects of enemy action by machine gun and shell fire. The competition brought in 26 entries.

Features of Recent Development in Truck Parts Design

Trend in truck design is well illustrated by changes and innovations developed by parts makers. In this article, Mr. Heldt has analyzed recent trends in engine, clutch, transmission, universal joint, rear axle and wheel design and has described a few of the more striking features developed.

By P. M. Heldt

NOTWITHSTANDING the general stagnation in the motor truck industry during the past year—or possibly because of it—there has been considerable development in the design of motor truck components. As has been the case for years past, most of this development has been in connection with the engines. This is partly due to the fact that the change in the characteristics of motor fuels has compelled certain changes in design. On the other hand, there seems to be a tendency to increase the speed of truck engines, which necessitates the use of lighter reciprocating parts, heavier crankshafts and heavier crankcases. Finally, the opening up of new fields of applications, such as to motor bus service and high speed transport work, has created a demand for engines of new characteristics. The following article is based upon the results of an inquiry among manufacturers of motor truck components as to the improvements made and new models brought out by them during the year.

One of the most interesting developments in the design of truck engines is the adoption of removable cylinder barrels. This construction has been used for some time in the truck engines manufactured by the Minneapolis Steel and Machinery Co. and the Wallis Tractor Co. These two concerns are manufacturers of farm tractors, and their use of removable sleeve engines might be ascribed to the fact that they are using in their trucks the same engines as in their tractors; the Wisconsin Motor Mfg. Co., however, which has recently come out with an engine with removable cylinder barrels, seems to have designed this engine specially for truck work.

The valve-in-head type of engine has made further gains and bids fair to become the standard type for commercial vehicles at least, where noiseless operation is not so important as in the case of passenger engines. In connection with this type there have been further developments in lubrication. Pressure feed is gaining ground constantly, and the practice of regulating the pressure in accordance with the load on the engine, which is now quite extensively used on passenger car engines, is also being applied in connection with truck engines.

The other branch of the truck components industry in which there has been considerable development is that of rear axles. The adoption of a speed truck model by so many truck manufacturers naturally has created a strong demand for units for such models, and it is found that a good many of the new components brought out the past year are for this type of vehicle. Rear axles for speed trucks of up to 1-ton capacity, are generally of the spiral bevel drive type. For trucks of larger capacity

the tendency in rear axle design seems to be toward the use of double reduction or bevel and spur gear drive axles. It will be remembered that the International Motor Co. came out with an axle of this type the past year, and now the Wisconsin Parts Co. has brought out a line of such axles, so that in future they will be found also on assembled trucks.

It should be pointed out that this article does not contain descriptions of all new truck parts that have been brought out in the course of the year, but only of such new parts as are of special interest in indicating trends in design and which have not already been described in AUTOMOTIVE INDUSTRIES.

New Midwest Line

The Midwest Engine Co. has brought out a line of truck and tractor engines comprising three four-cylinder models of the following cylinder dimensions: $3\frac{5}{8} \times 5$ in.; $4\frac{1}{8} \times 5\frac{1}{4}$ in. and $4\frac{1}{2} \times 6$ in. All three models are designed on the same lines. The horsepower outputs, according to the manufacturers, are 39 hp. at 1800 r.p.m., 47.5 hp. at 1600 r.p.m. and 61 hp. at 1500 r.p.m. for the three models respectively. Perhaps the most interesting feature of these engines is the use of a two-bearing counter-balanced crankshaft, which is uncommon for such large engines as $4\frac{1}{2} \times 6$ in. The company has also developed a smaller high-speed heavy-duty engine for trucks, tractors, taxicabs and motor buses. This is a four-cylinder engine of $3\frac{1}{4}$ -in. bore and $4\frac{1}{2}$ -in. stroke, and the maximum output is given as 33.8 hp. at 2400 r.p.m. The general design of this engine is quite similar to that of the other three models, except that no counterweights are used on the crankshaft and the engine is designed for thermo-syphon cooling instead of pump cooling. A sectional view of the smaller engine is shown herewith, and the chief features of construction are as follows:

An exceedingly heavy crankshaft is used to prevent whipping, the diameters of all bearings being $2\frac{1}{4}$ in. Large oil passages are drilled through the crankshaft and part way through the camshaft, force feed lubrication being used. The rate of feed of the oil is controlled in accordance with the load on the engine and not by the speed. This prevents excess oiling at low speeds and light loads. The oil is delivered to all crankshaft, connecting rod and camshaft bearings under pressure generated by a self-priming, gear-type pump driven from the rear end of the camshaft. The feed of oil is controlled by the vacuum in the intake manifold, reducing the pressure on the oil relief valve when the throttle is nearly closed and the suction therefore strong. The

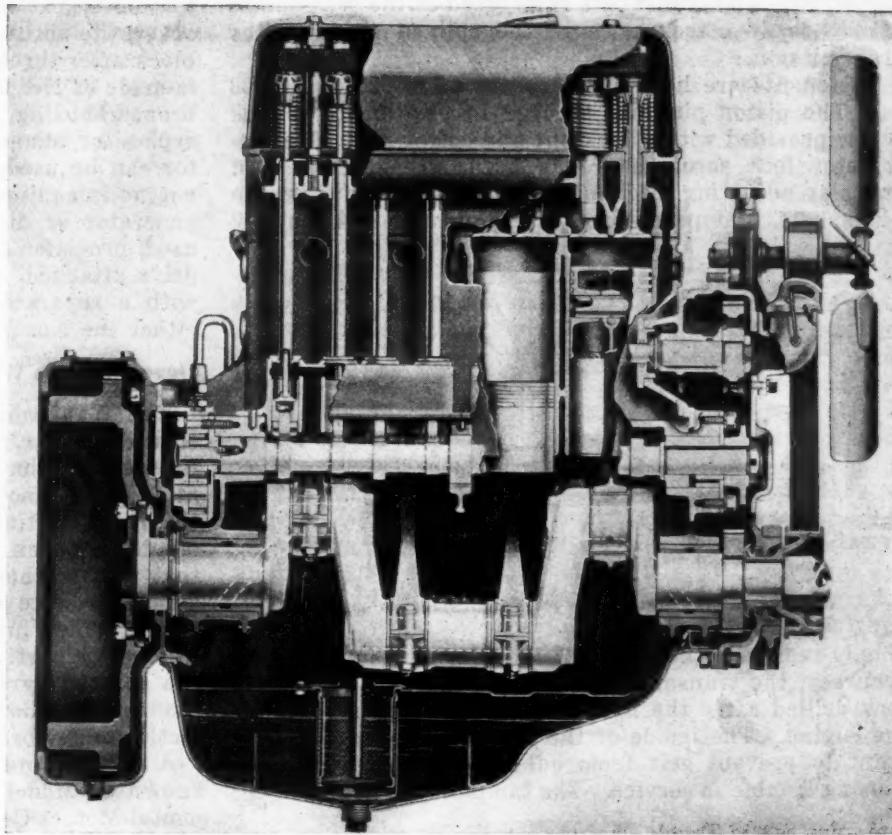
position of the oil leads in the crank-shaft forces the oil out on the bottom side of the connecting rod bearings. No oil grooves or shims are used. There is no direct lead for the oil to pass out of the connecting rod bearings, which is said to insure an unbroken film from the point of entrance of the oil to the outer edges of the bearing. As a result comparatively loose bearings can be used and thus the bearing friction reduced.

There is no breather on the crank-case, but instead the crankcase is placed in communication with the valve chamber on top of the engine through eight tubes surrounding the valve tappets, and a breather of special design is placed on the valve cover. This arrangement causes a circulation of air carrying a mist of oil through the valve chamber, which insures effective lubrication of the valve mechanism, and at the same time it tends to keep dust out of the engine. The weight of this engine with bell housing is approximately 425 lb. and with open fly-wheel, 390 lb. The cylinders and upper half of the crankcase are a single casting, while the cylinder head, containing the valve, is cast separately, and the oil pan is a steel pressing. The connecting rod bearings are $2\frac{1}{4}$ in. in diameter by $1\frac{5}{8}$ in. in length; the front main bearing measures $2\frac{1}{4}$ by $2\frac{3}{8}$ in. and the rear main bearing $2\frac{1}{4}$ by $2\frac{3}{8}$ in. Roller type cam followers are used. The valves have a clear diameter of $1\frac{1}{2}$ in. and a lift of $\frac{3}{8}$ in. The bell housing is a No. 4 S. A. E. standard.

Wisconsin Has Valve-in-Head Engine

The Wisconsin Motor Mfg. Co. is coming out with two new models of truck engine, the SU, which is a four-cylinder $3\frac{3}{4} \times 5$ in., intended for 1 and $1\frac{1}{2}$ -ton trucks, and the Model NU, a four-cylinder $4\frac{1}{4} \times 5$ in., intended for 2 and $2\frac{1}{2}$ -ton trucks. In the larger of these two engines, the established practice of the Wisconsin company has been closely followed, but the Model SU differs in many important particulars. This engine is of the valve-in-head type, the cylinder heads naturally being removable. A feature that is as yet rarely met with in truck practice is the removable cylinder barrels. Three-point suspension is employed and the crankcase and cylinder-block with the exception of the removable cylinder barrels—are one integral iron casting. The entire valve mechanism is enclosed, and for easy mounting and dismounting the valve tappets are assembled on removable plates on the right-hand side. The crankshaft is a chrome nickel steel forging and is supported in three bronze-back, babbitt-lined bearings of the following dimensions (front to rear): $1\frac{15}{16} \times 2\frac{1}{2}$ in.; $2 \times 2\frac{1}{2}$ in.; $2\frac{1}{16} \times 3$ in. It will thus be seen that the bearing sizes are tapering from one end to the other, a feature which facilitates the manufacturing operations. The connecting rod bearings are 2×2 in.; the diameter of the wristpin is $1\frac{1}{16}$ in. and the diameter of the valves $1\frac{11}{16}$ in. This engine is provided with an S. A. E. standard bell housing No. 3 and the S. A. E. standard supporting arms No. 2.

The NU model is of the block type with L-head cylinders and an aluminum crankcase. The cylinder head is removable. Crankshaft and bearings are of the same



Sectioned view of Midwest high speed, heavy duty engine

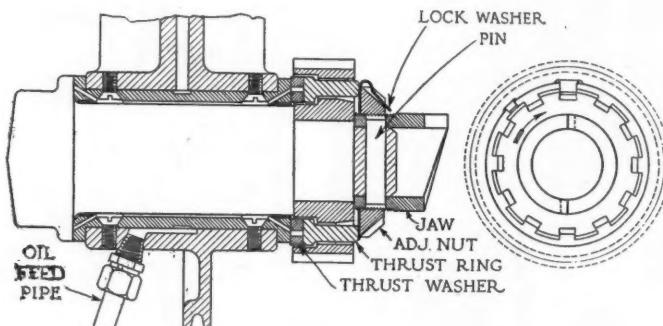
type as in the SU model. A separate steel supporting arm bolts to the bell housing. Lubrication is by force feed, pressure on the lubricating oil being produced by a gear pump. Water is circulated by a centrifugal pump. Generator, starter, inlet and exhaust manifold and carburetor are mounted on the right-hand side; water pump, magneto, oil filler, breather and oil gage on the left. A governor drive can be furnished. The main bearings of this engine have the following dimensions (front to rear); $2\frac{1}{8} \times 2\frac{1}{2}$ in.; $2\frac{3}{16} \times 2\frac{1}{2}$ in.; $2\frac{1}{4} \times 3\frac{1}{2}$ in. The connecting rod bearings are $2\frac{1}{8} \times 2\frac{1}{4}$ in. and the wristpin is $1\frac{3}{16}$ in. in diameter. The valves have a diameter of $1\frac{31}{32}$ in. The standard supporting arm is $2\frac{1}{2} \times 5$ in., but other arms can be furnished.

Herschell-Spillman Improvements

The Herschell-Spillman Motor Co. manufactures one size of engine suitable for motor truck purposes, a four-cylinder $3\frac{1}{2} \times 5$ in., which is recommended for trucks up to $1\frac{1}{2}$ tons capacity, and especially for speed wagons. A number of changes in the design of this engine have been made during the course of the year, as follows: The cylinder head studs and nuts have been increased from $7/16$ to $1/2$ in. An open slot is now provided in the fan bracket so that the fan can be easily removed when desired. The valve adjusting nuts are now provided with oval heads to insure proper contact with the valve stems and allow positive adjustment. Fiber thrust washers are provided to take care of any play in the fan driveshaft. The connecting rod bearings are riveted in place to prevent movement of the bearings detrimental to the operation of the engine. All main bearings are now secured in place by screws so that there can be no movement of the bearings tending to cause wear and noise. End play of the camshaft is adjusted by means of a hardened disk inserted in the hub of the camshaft gear against which bears the end of a hardened adjust-

ing screw. The crankshaft is recessed at the rear end to take care of inaccuracies in the splined shaft of the transmission.

Piston fits are held to tolerances of 0.0025 and 0.003 in. The piston pins are secured in position by a lock screw provided with a lock nut and cotter pin. The distributor lock screw boss has been strengthened. An end play adjusting mechanism has been provided on the crankshaft, and permits of taking up the end play by



End thrust adjustment on Herschell-Spillman engine

simply removing the oil pan. In order to insure greater accuracy, the transmission circle of the bell housing is now drilled after the bell housing has been secured to the engine. The inside of the engine is given a coat of paint to prevent grit from adhering to the walls and causing trouble in service. The fan pulley is now flanged.

Hercules Speed Truck Engine

An improvement in the lubricating system of its models, CU, MU and T, has been made by the Hercules Motor Mfg. Co. This consists in the provision of an oil pressure regulator located at the forward end of the engine close to the oil pump. Adjustment of the relief pressure can be made by merely removing a cap and adjusting a screw. This oil regulator is of the conventional spring-pressed ball valve type. On the Series NU the main bearing studs have been increased in size from $\frac{1}{2}$ to $\frac{9}{16}$ in.

The company has just developed a new engine intended for $\frac{3}{4}$ and 1-ton speed trucks which has been adopted as standard equipment for the new light truck of the Ruggles Motor Truck Co. This engine is a four-cylinder 4 x 5-in. and weighs slightly less than 600 lb. Cylinder block and crankcase are cast integral, while the oil pan is made of aluminum. The engine has a three-bearing crankshaft, with force-feed lubrication to the main bearings. An output of 42 hp. at 2000 r.p.m. is claimed, and the engine is said to run without perceptible vibration at all speeds. The waterjacket runs the full length of the cylinder block, which is said to be exceptionally strong on account of the rigid supports for the three bearings. The caps of the main bearings are babbitted without the use of a supporting shell for the babbitt. Shells are used for the upper half of the bearing, however. There are no shells in the bearings of the connecting rods, which latter are first tinned and then have the babbitt poured into them. Cylinders and pistons are ground, the tolerances on the cylinder bore being plus and minus 0.001 in. The piston pin bearing is in the piston bosses, the pin being rigidly clamped in the upper end of the connecting rod.

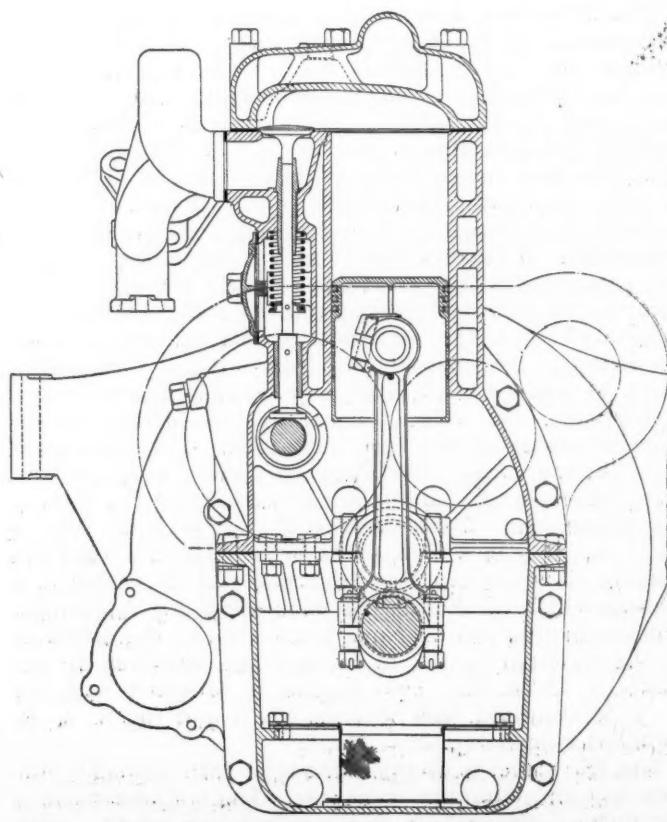
The engine is designed for three-point support, having two arms cast integral with the bell housing and a third supporting point in the form of a trunnion integral with the front cover. The fan is driven from the water pump driveshaft. This shaft is $1\frac{15}{16}$ in. in diameter and is carried in a sleeve, with

the drive gear on one end and the pump coupling on the other, the entire unit being removable from the cylinder block after three screws have been taken out. The shaft is made of No. 1040 carbon steel and runs in a phosphor bronze housing. The engine is built for either thermo-syphon or pump cooling, and a "through-shaft" generator can be used with the magneto at the end when the engine is equipped for thermo-syphon cooling, or with a generator or distributor drive. If pump circulation is used, provision is made for a generator with distributor drive attached, or for a magneto. This engine is fitted with a separate bell housing, which permits of using either the No. 2 or No. 3 S. A. E. standard.

Developments With Other Concerns

The Waukesha Motor Co. has made a change in its smallest motor, the Model BUX (which is a $3\frac{3}{4}$ x $5\frac{1}{4}$ -in. four-cylinder) with the object of improving the operation of the motor under light loads. This consists in the incorporation of a vaporizing device in the intake manifold which vaporizes the heavier particles of fuel that might otherwise get into the cylinders in an unvaporized state when operating at small loads and low speed. When bringing out their new line of engines, of which this particular model is one member, the Waukesha company greatly increased the depth of the crankcase and the diameter of the crankshaft to overcome objectionable vibration in truck work.

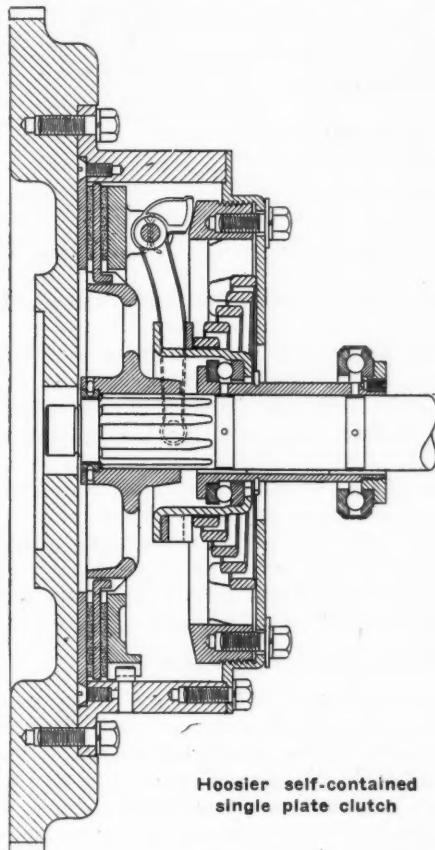
A new engine model for use on motor buses, to be known as Model 4-L, has been developed by the Continental Motors Corp. This engine is adapted for vehicles of $4\frac{1}{2}$ to $5\frac{1}{2}$ tons total weight and is especially designed to facilitate lubrication and to meet high speed requirements. Several changes intended to insure more efficient operation has been made by the Lycoming Motors Corp. Light pistons and connecting rods are being used, and bronze-back, babbitt-lined bearings have replaced the plain die-cast bushings in the main bearings and connecting rods.



Cross section of Hercules speed truck engine.

In clutches the tendency seems to be toward the dry-disk type, either single or multiple disk, and a good many of the manufacturers specializing in this line have made minor improvements or added new models in the course of the year. Thus the A. J. Detlaff Co. is now using radial thrust bearings on all of its clutches instead of the straight thrust bearings formerly used. It has also adopted woven asbestos linings.

The Hoosier Clutch Co. has brought out a new model



Hoosier self-contained
single plate clutch

of single-plate clutch which, however, can be built also as a duplex type, being so designed that practically all of the parts are interchangeable, the 10-in. duplex size replacing the 12-in. single plate. This makes it possible for the truck manufacturer to service the clutches by carrying only one size of clutch parts. By enclosing both the single plate and the duplex clutch in a housing, making these clutches self-contained, it is claimed that the assembling of the clutch on the chassis is facilitated, the cost of the flywheel reduced and alignment within the clutch itself is assured. The single plate clutch is made in 8, 10 and 12-in. sizes and the duplex clutch in 8 and 10-in. sizes. All models are made either with or without the inside bearing on the sleeve, on both the amidships and the unit-power plant types.

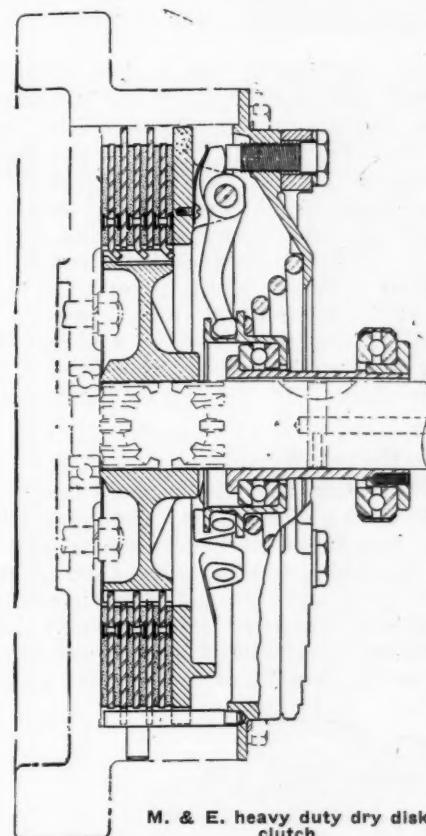
Fuller & Sons Mfg. Co., in its unit type of transmission, which combines a transmission and clutch, now provides automatic oiling for the clutch throwout bearing. All models are now also provided with an oil-level filler hole. Oil is poured into the transmission until it reaches the filler hole. This latter improvement was made primarily to prevent the operator from putting an excessive amount of oil in the transmission case, with the idea of obviating the need for frequent renewal of the supply. An excess of oil in the case is undesirable because it will work out through the bearings and joints, and also because it tends to lower the efficiency of the transmission.

Merchant & Evans Co. has added a heavy-duty dry-

disk type of clutch, as shown in the accompanying illustration. It will be seen that although this is a multiple-disk type, the pressure of the clutch spring is multiplied by radial levers, of which there are three to each clutch. A handy adjusting device is provided. The thrust of the clutch spring is taken up on the ball thrust bearing and the clutch throwout collar also is in the form of a ball thrust bearing. The clutch drum is mounted on the clutch shaft with a splined fit.

Transmissions

Manufacturers of truck transmissions with one or two exceptions do not seem to have introduced any additional models during the past year. One of the exceptions is the Fuller & Sons Mfg. Co., which has brought out two new models. Its model SU-1, which is for speed trucks up to 1 1/4-tons capacity, has a low gear ratio of 4 to 1, while its model J, which is limited to trucks of 3/4-ton capacity, has a low gear ratio of 3 1/2 to 1. This firm strongly advocates the detachable power take-off and the selling of the transmission with a power take-off opening, so that a power take-off may be mounted at any time after the truck is sold. These transmissions are provided with the S. A. E. short-length mounting for power take-off, and the power take-off are designed accordingly; they are placed over the constant-mesh



M. & E. heavy duty dry disk clutch

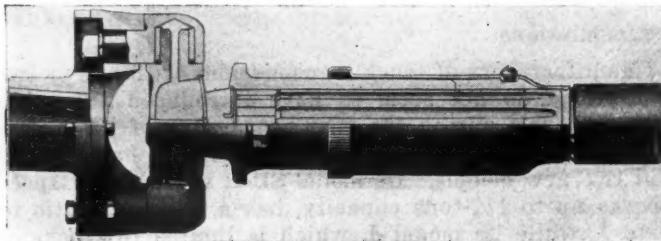
set, the power take-off gear meshing with the large gear on the countershaft. All models of transmission of this company are also provided with openings for tire pumps according to the S. A. E. standard. In some cases the tire pump opening is over the reverse idler gear and in other cases over the large countershaft gear of the constant-mesh set.

Universal Joints

Considerable development work has been done in the line of universal joints and several of the manufactur-

ers have brought out entirely new designs. The Peters Machine & Mfg. Co. have developed adapters which are claimed to make the front and rear universal joints complete units and allow of the rapid assembly to companion flanges on the transmission and on the axle. The cross pins are now subjected to a special heat-treatment to increase the life of their wearing surfaces. A spline sleeve covers the entire splined portion of the shaft and

work. This, in most cases, means a much higher propeller shaft speed, and universal joint manufacturers are compelled to make changes to meet these conditions. Snead & Co. produce ten different sizes of universal joint and propeller shaft units, all of the same general design. They specialize on four or five sizes. The feature of the Snead unit is the use of nickel alloy steel, electrically heat-treated tubing which permits of the



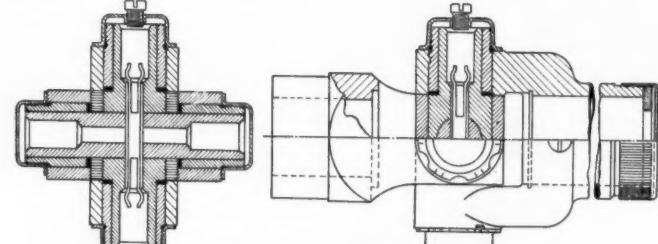
Peters universal and sliding joint with spline-protecting sleeve

serves as a lubricant retainer, thus insuring proper lubrication of the splined sliding joint. A patent on this feature has been applied for. The sleeve at the same time protects the splined shaft from mud and dust, thus increasing its life. The splined shaft is now made from a heat-treated steel and is hobbed and ground to close limits. This company manufactures six sizes of universal joint assemblies, four of which are for truck use.

Blood Bros. Machine Co. has made a refinement in its joints whereby the lubrication of the bearings is facilitated. This improvement is illustrated by the drawing herewith. The new joint is known as the Model B, and it is claimed to possess the advantages of improved lubrication, lighter weight and reduced number of parts. Referring to the accompanying drawing, the lubricant (heavy oil or soft cup grease) is forced to all of the bearings under pressure, and lubrication of the bearings is maintained by centrifugal force. Section BB shows the knurled bushing developed as a safeguard against the turning of the bushing in the yoke ear. The same section also shows how the cap is permanently locked in place.

Tendency to Reduce Weight

Snead & Co. state that the general tendency in universal joint design during the past year has been to reduce the weight of propeller shafts and universal joints to a minimum, to eliminate as far as possible all vibration or whip at high operating speeds. This feature is especially important at the present time because of the tendency of automotive engineers to utilize high-speed engines for trucks as well as for passenger car



Blood Bros. oil-lubricated universal joint

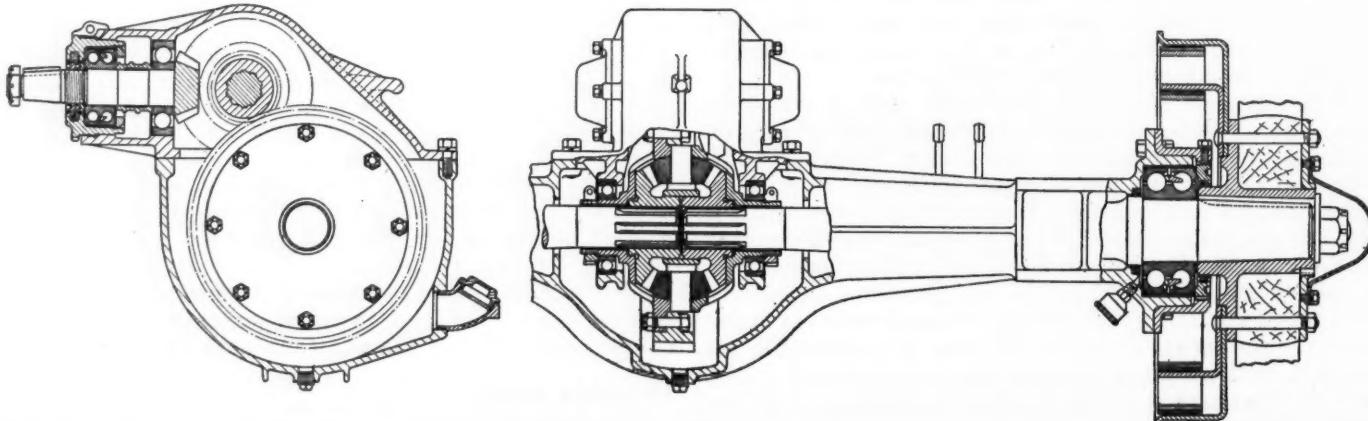
use of light wall thicknesses and consequently low weight.

The Carl Pick Co. has brought out a small universal joint primarily for power take-off purposes in connection with dump body hoist equipment. This joint is provided with a positive means of lubrication and lubricant retention.

One of the parts of motor trucks in which there continues to be intensive development is the rear axle. This probably is due to the fact that there are a number of different forms of final drive in the field, and the rivalry between these different methods of drive stimulates advancement in design.

Wisconsin Double Reduction Axles

The Wisconsin Parts Co., which has been manufacturing a line of worm-driven axles, is continuing that line, but in the course of the year has brought out in addition a double-reduction type of rear axle and is now in production on six models of uniform design. The advantages claimed for this axle may be briefly summarized as follows: The whole reduction takes place at the center of the axle, where all gears and bearings can be securely supported and held in alignment, in which respect the double-reduction axle is similar to the worm-drive axle. The power of the engine is transmitted first through a pair of spiral-bevel gears and then through a pair of spur gears to the differential and driveshafts. The differential is combined with the second reduction set and therefore rotates more slowly than it would if it were placed in the first reduction set. The axles are of the semi-floating or fixed-hub type, as shown in the sectional view herewith.



Wisconsin double reduction axle

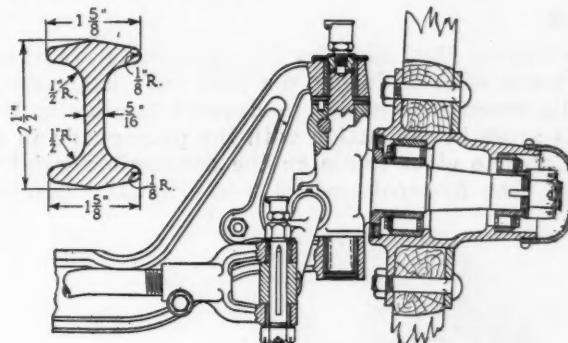
All gears are forged of 3½ per cent nickel steel. The spiral bevel gears are cut with long addendum teeth, while the spur gears are cut with stub teeth. The differential gear is of Brown-Lipe-Chapin make and of the four-pinion type. All of the gears of the differential are of the stub-tooth form and forged from alloy steel. The axle driveshafts are forged from chrome nickel-steel, while the housing is a malleable casting of suitable section and well ribbed, for stiffness. The bowl at the center of the axle constitutes a reservoir for lubricant, which latter is elevated and distributed by the ring gear. There are grease cups on the wheel bearings.

Bus and Trackless Trolley Axle

In addition to the standard line of double-reduction axles, the Wisconsin Parts Co. is now at work on a special type of double-reduction axle particularly applicable to motor buses and trackless trolleys. One of the factors of importance in a motor bus is a low center of gravity permitting of low floorboards, which results in convenience to passengers and in increased stability and safety of the bus. Accessibility of parts that require periodical repair is also essential. The Wisconsin company has designed an axle known as Model 120-K, which, it claims, successfully meets these requirements. This axle has a wide tread. The pinion shaft center is in the same horizontal plane as the axle proper. This permits of a greater top clearance and provides for a straight-line drive with low floorboards.

The same brake system is employed on the double-reduction axles as on the worm-drive line. Service and emergency brakes operate in separate drums arranged concentrically on the rear wheels. Three decided advantages are claimed for this form of brake construction, as follows: The heat generated at one drum is not transferred to the other; hence when it is necessary to have long-continued brake action, as in driving in hilly country, the service brakes may be applied alternately with the emergency brakes, the efficiency of one brake not being impaired by the application of the other. Another advantage is that the brake camshafts are separated, and there is therefore no danger of the two shafts binding and freezing, as often occurs when the two shafts are concentric. The third advantage resides in the fact that because of the concentric arrangement of the brake drums it is practically impossible for lubricant to get onto the service brakes. If any oil or grease should work its way through the double felt retainers on the driveshaft, it is caught by the inner drum, thus leaving the drums of the service brake dry.

New front and rear axles for speed trucks have been brought out by the Salisbury Axle Co. The rear axle is of the spiral bevel-driven type, the differential and driving gears being of Brown-Lipe make and designed with coarse teeth to insure maximum strength and life. The pinion and pinion shaft are an integral part, made of alloy steel and heat-treated. The drive-shafts are made of chrome-nickel steel, of tapering section and heat-



Salisbury front axle end

treated. Each shaft is given a Brinell test. The axle is of the three-quarter floating type, which is claimed to combine the chief advantages of both the full-floating (easy removal of shafts) and the semi-floating type (reduction of loads on bearings and tubes when rounding curves).

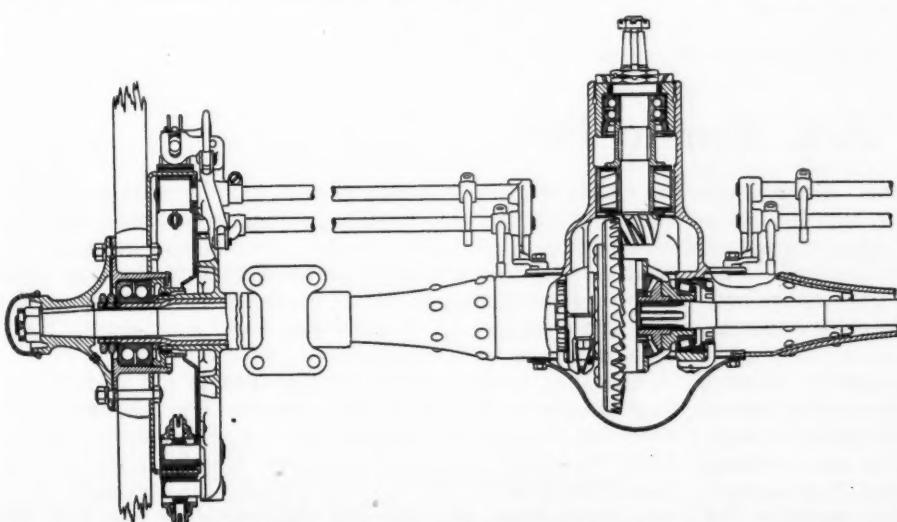
The brakes are 16 in. in diameter and are provided with adjustments for taking up wear on the lining. The axle tubes are made of heavy seamless steel tubing and are pressed into the housing center and riveted in place under pressure. The driveshafts are rendered accessible after the removal of eight hexagon nuts on the driving flange, after which the driveshaft and flange can be withdrawn together without jacking up the wheel, as the full load is carried on roller bearings in the hub. The brake shafts are mounted in oilless bushings, thus eliminating the necessity for oiling inaccessible bearings. The differential gear carrier can be removed after unscrewing the cap screws which hold it to the housing.

The axle center and steering arms of the front axle are made of 1040 S. A. E. carbon steel, which is heat-treated and is required to show a Brinell test of from 380 to 425. The steering knuckles are made of chrome nickel steel and are heat-treated to show a Brinell hardness of 325 to 360. The knuckle pins, tie-rod pins, knuckle pin bushings, tie-rod bushings and spindle thrust

washers are made of carbon steel, carbonized and hardened to show a scleroscope hardness of between 75 and 85, the parts being ground after hardening.

The National Axle Co., which is manufacturing a line of worm-driven axles, has added a new type A which is suitable for speed trucks of 1/4-ton capacity, as well as for taxicabs. In addition the company is manufacturing a type 100 worm-driven axle for speed trucks of 1-ton capacity.

A number of improvements in design have been made by the Torbensen Axle Co. in its line of internal gear-driven axles. The pinion shaft mountings have been changed and S. A. E. standard tapers have been incorporated in the two smaller



Salisbury bevel gear drive speed truck rear axle

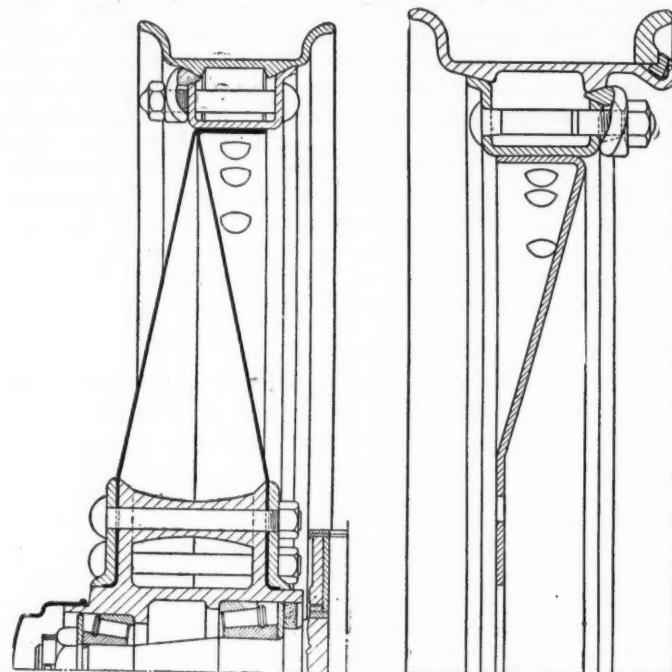
models. The object of the change in the pinion shaft mounting is two-fold, namely, to increase the bearing capacity so as to extend the periods between adjustments and also to permit of gear adjustments without the necessity of disturbing the bearing adjustment. The changes referred to were made in axles intended more particularly for speed wagons and pneumatic tired trucks.

Wheels

The Dayton Steel Foundry Co., manufacturers of cast-steel truck wheels, during the past year has considerably lightened its wheels. A demand for lighter truck wheels arose in connection with the propaganda in several states to place limits on the permissible weight of trucks. The five-spoke wheel was originally developed



Sectioned view of
Smith cushion wheel



Sections of Indestructible Wheel Co.'s double disk and
single disk wheels

duction is even more radical in the case of a set for 5-ton trucks, amounting to about 250 lb. This lightening of the wheels is the more important because the weight eliminated is unsprung weight.

In order to produce smoother castings the company has installed metal patterns and equipment for handling them. This is said to have resulted not only in smoother castings but in fewer shifts and a minimum percentage of scrap.

The double disk pressed steel wheel for motor trucks of the Indestructible Wheel Co. has been improved by a new bracing center, on which a patent has been applied for. The company has recently brought out a single-disk wheel for speed trucks. This comprises a coned disk to be secured to a hub flange by bolts, which is provided with a wide lateral flange at the circumference to which a steel rim or felloe is secured. The center hole of the wheel disk can be either drawn or bored straight to fit the hub, and the number and diameter of the holes and the diameter of the bolt circle made to fit the design of the hub flange. The wheel is designed to take a Firestone demountable rim.

by the Dayton company some years ago, but at that time it did not meet with much favor, on account of the rather radical departure from principles that had been applied to wheel design for centuries. The weight of a set of four wheels for a 2-ton truck is now approximately 100 lb. less than it was a year ago. The weight re-

"Ask 'Em to Buy"

WHEN the Automotive Equipment Association adopted the slogan "Ask 'em to buy," it said something. It said something that manufacturers can well take the trouble to pass on to their dealers. The more this simple selling necessity can be emphasized, the more money will there be in the automobile business next year.

One of the machine tool makers has recently started a sales campaign embodying an idea that manufacturers should be interested in from a sales promotion standpoint. The Van Norman Machine Tool Co. has recently brought out a small "Relio" grinder, which it is marketing to garages and service stations. This machine has been rigged up on the back of a Ford car, in such a

way that it is self-contained. It can be plugged in on the lighting circuit, thereby making it possible for the salesman to actually show the prospect the machine, as well as the type and kind of work that it can do. The idea is a novel one so far as machine tool selling methods are concerned. It embodies the "Ask 'em to buy" idea in a practical way.

The specific application of the idea is not adapted to any of the selling problems confronting the manufacturer or his dealer organization. The fundamental behind the idea, however, does apply. The instance is cited here simply to show how one company has worked out a new sales idea, suitable for their product and for the selling period in which it now is. "Ask 'em to buy."

Committee Recommends Standards for Tests of Welds

American Bureau of Welding committee finds that three standards, shop, commercial and research, are desirable. Different tests are required for each of these standards. The different methods are fully described.

A COMMITTEE on welding research and standardization of the American Bureau of Welding, which is a joint advisory board of the American Welding Society and the Engineering Division of the National Research Council, has recently made a report on the subject of standards for tests of welds. Following is a review of the recommendations made in this report.

The basis for measuring the effectiveness of a joint between two pieces of metal is the base metal without a joint. Therefore, the quality of a joint is best determined by comparing the characteristics of a section of the structure which includes the joint with those of a similar section which has no joint.

Three standards are desirable as follows:

(a) *Shop Standard.* In the shop a standard test is required for such purposes as checking the work of a welder from time to time, testing a new lot of electrodes in electric welding or of welding wire in gas welding, testing the effect of some change in conditions which may have taken place, etc. Such a standard must necessarily be as simple as possible and preferably a single test. The procedure must be of a simple character.

(b) *Commercial Standard.* There are many cases

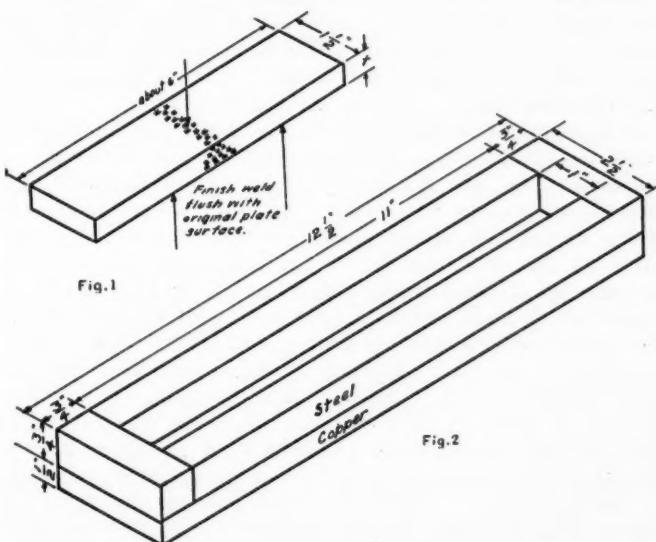
purposes, all tests and examinations are made which will contribute any information in regard to the characteristics of the weld. It may be necessary to make tests of a special character in special kinds of welds or where application under unusual conditions is contemplated, but there should be a standard list of tests which will give information which is complete as far as all ordinary requirements are concerned.

Definitions.

- (a) A weld is a solid union of metallic pieces formed by uniting or consolidating by hammering or compressing with or without previous softening by heat.
- (b) A fusion weld is a weld formed by heating to a fluid state the edges of the pieces to be joined and allowing the metals to flow together (with or without additional molten metal being supplied) without any pressure being applied. The heat may be supplied by a gas flame, an electric arc, thermit or otherwise.
- (c) In a fusion weld, the *base metal* is the material composing the pieces to be united by the weld. Unless otherwise expressly stated, it is understood that a weld joins two pieces of identical material.
- (d) In a fusion weld, the *weld metal* is the material which has been used in forming the weld. It may consist entirely of the base metal adjacent to the weld or of the material added to the fused base metal from a welding rod or electrode, or other material.
- (e) *Filling metal* is the metal added during the welding process to form part of the weld. In gas welding it is supplied by means of a *welding rod*, in carbon arc by a *filling rod* and in metal arc welding by the *electrode*.
- (f) A *test weld* refers to a sample of welding which has been performed under known conditions and upon which mechanical tests are to be made.
- (g) A *test specimen* is a prepared piece on which a mechanical test is to be made.

For the shop standard a bending test only is recommended; for the commercial standard, both a bending and a tensile test, and for the research standard, tests of the base or parent metal, of the weld and of the filled-in metal, the various tests of each metal being enumerated. Wherever possible the standard procedure of the American Society for Testing Material is to be followed, as given in the A. S. T. M. Report for 1918. Three duplicate specimens are to be tested in each test and the average taken as the value of the property determined by the test.

The most interesting of the proposed tests is the bending test, as this is to be the shop standard. Shape and dimensions of the specimen for this test are given in Fig. 1. In the case of welds in flat rolled material the surface of the weld is to be machined substantially flush with the surface of the specimen, unless the specimen is bent or offset, in which case it is to be machined all over. Cast and other irregular-shaped specimens are to be



where more than one kind of test should be made, but where the circumstances do not justify a complete investigation. There is, therefore, a need for what might be termed a commercial standard for making, for example, comparisons between different commercial welding processes or between different kinds of electrodes in electric metal-arc welding or different wires in gas welding.

(c) *Research Standard.* When a complete investigation of a weld is to be made for research or other

machined all over. It is essential that the edges of all specimens be machined to remove material in a condition likely to cause premature failure. The thickness of a weld specimen is to be as nearly as possible that of the base metal.

In the case of the weld metal, a specimen may be prepared from a bar of weld metal prepared the same as for tensile tests. The box, Fig. 2, is to have a width of

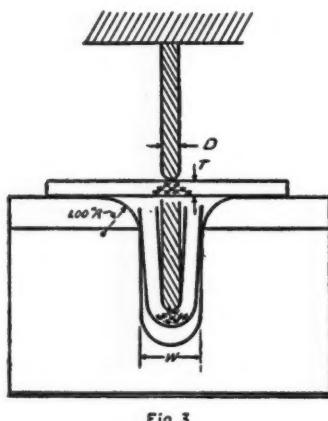


Fig. 3

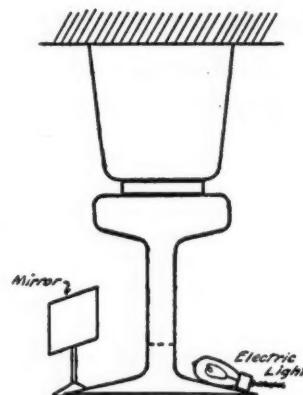


Fig. 4

1.75 in. and the thickness of the specimen is to be that of the test weld. These specimens are to be machined all over.

In order to load the specimens so that as large a part of the bend as possible occurs in the weld metal, the special fixture illustrated in Figs. 3 and 4 is to be used. It can be conveniently used with any standard testing machine. The cylindrical surface D, Fig. 3, about which the specimen is bent, conforms to the requirements of the American Society for Testing Materials for bending tests of the base metal. This piece is attached to the underside of the moving head of the testing machine. Upon the platform are to be fastened two blocks having machined top surfaces and polished corners of a radius of 1 in. These blocks are to be separated a distance

$$W = D + 2T + \frac{1}{8} \text{ in.}$$

A lubricant of lard oil and graphite or similar compound is to be used on these surfaces.

Two specimens are to be tested. The load is to be applied at the center of the weld—in one specimen to the open side of the Vee and in the other to the closed side. The rate of application of the load is not to exceed that at which the beam can be kept balanced at all times, or a maximum of 2 in. per minute. The angle through which the specimen is bent may be measured by any convenient method. The following method is described as a matter of information:

A piece of paper is held firmly against the edge of the specimen when it is in place on the testing fixture and a line drawn on the paper along a corner of the specimen, thus outlining the shape of the specimen so far as bending is concerned. A line is drawn before loading and after failure occurs. The change in the angle in the two lines as determined with a draftsman's protractor

is the angle through which the specimen had been bent at failure.

The test results to be recorded are the total angle through which the specimen has been bent when the first crack appears upon the convex surface (that is, the sum of the angles through which the two halves are bent), and is to be measured without removing the load. An electric light and mirror will assist in observing this surface, as indicated in Fig. 4; also, the load on the specimen at which the first crack occurs.

The tensile test specimen for sheet materials is shown in Fig. 5. The thickness of the specimen may be anything desired, but a thickness exceeding $\frac{3}{4}$ in. would require a testing machine in excess of 100,000 lb. capacity. If the specimen is cut from standard sheet material, it is usually not necessary to machine the 1.5-in. faces of the specimen. The tensile test specimen for cast or brittle material is indicated in Fig. 6. It is particularly important to use swivel specimen holders when testing such specimens, in order to eliminate undesirable stresses.

The test results to be recorded include the ultimate strength, calculated from the area of the original section, the yield point, the contraction of area and the appearance of the fracture. The proportionality limit, the modulus of elasticity and the total elongation may be recorded if desired.

The shape and dimensions of the test specimen for tensile tests of the weld metal are shown in Fig. 6. It is to be prepared from a bar of weld metal $\frac{3}{4} \times 1 \times 11$ in. This bar is to be formed entirely by depositing filling metal in an open box of the shape shown in Fig. 2, employing exactly the same method as used in making the corresponding test weld. For metal electrodes this box is to consist of copper plate $\frac{1}{2}$ in. thick, upon which is secured a frame of steel bars $\frac{3}{4}$ in. square. The parts of the box are secured in any convenient manner. During this operation the copper plate is to rest on a steel plate. After the bar is formed the copper plate and the frame may be removed by machining. For gas welding the copper plate is to be replaced by a steel plate. For thermit, a box of suitable refractory material should be used. The test results to be recorded are the same as those for the tensile test of the base metal.

Shape and dimensions of the test specimen for tensile tests of the weld are given in Fig. 5, with the weld at the center. If the material is cast or brittle the specimen shown in Fig. 6 is to be used, with the weld located at the center. It is especially necessary that the 1.5-in. sides of the specimen be machined, particularly if the two pieces of base metal are offset or if they form an angle at the weld. Tests made in the latter case, where the specimens are not machined, are not reliable. Furthermore, care must be taken that specimens having the latter defect are not "straightened" before being machined, because such treatment is likely to materially decrease the strength of the weld. A roughing cut in the planer or shaper which will just clean up the surfaces of the specimen is sufficient. The test results to be recorded are the same as for the tensile test of the base metal.

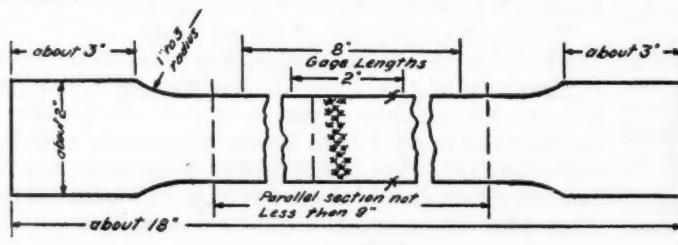


Fig. 5

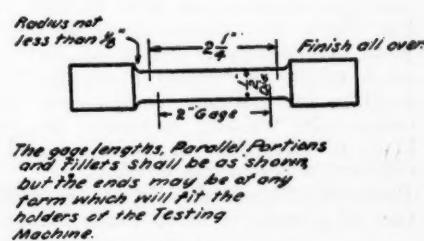


Fig. 6

How Diecastings Are Produced

A description, not only of the methods followed, but of various types of diecasting machines employed. Considerations to be borne in mind in the design of parts to be diecast and the characteristics of various alloys used are outlined. Diecastings of gearboxes, etc., now possible.

By Herbert Chase

DIECASTING owes its rapid growth in large part to the automotive industry, but that industry is none too well acquainted with methods used in diecasting and partly for this reason has failed to visualize the possibilities of diecasting or make full use of existing facilities.

One purpose of this article is to convey to the automotive industry certain information which, though more or less elementary in character, is quite necessary to an appreciation of the subject. Most of the information here given was secured as a result of a recent visit which the writer made to the plant of the Stewart Mfg. Co.

The primary reason for diecastings is, of course, the fact that as they come from the mold, they require little if any finishing, since the surface is smooth and the dimensions can be held to close limits. Furthermore dies are sufficiently durable to enable the rapid manufacture of several thousand castings with practically no variation in size as between the first and last piece. A great majority of the castings made to-day are of relatively small size, but zinc-base castings weighing as much as 11 lbs. each have been successfully produced in large quantities (one such casting is shown in an accompanying cut) and the concern mentioned considers it possible to diecast pieces as large as the gearcase used on some of the smaller passenger cars to-day. Thin section curtain light frames measuring 8 x 28 in. are readily made in aluminum alloy by this company to-day and it is considered but a short step to the production of castings of similar or larger major dimensions, with the third dimension much greater than that of the frame mentioned. These instances are cited simply as a means of indicating that the near future may well see some interesting developments in quantity

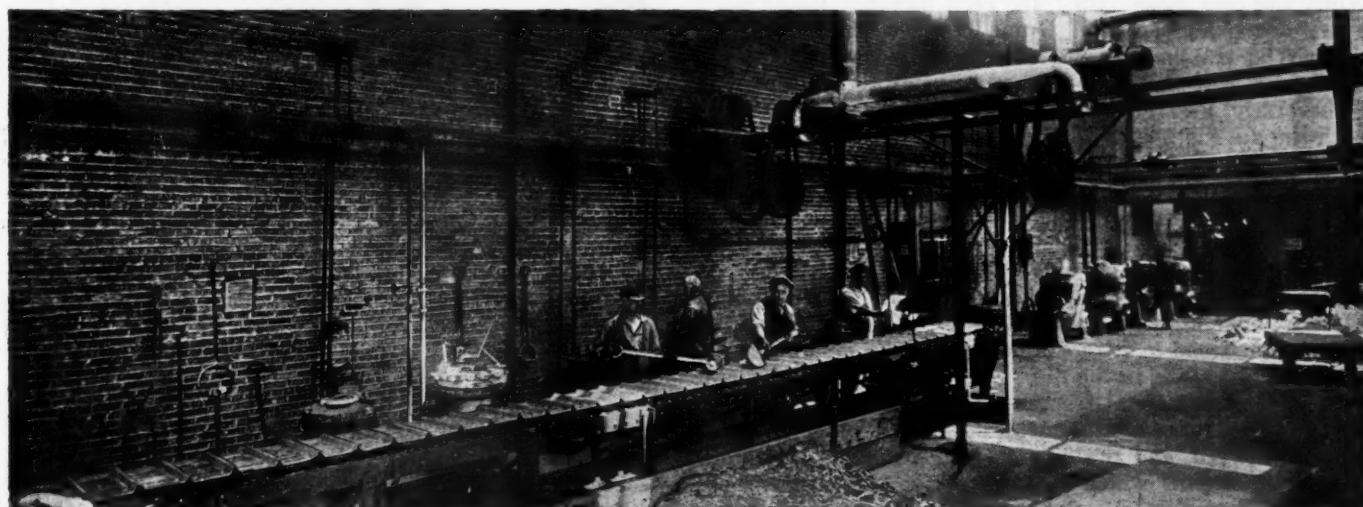
production of much larger diecastings than have heretofore been thought feasible.

For best results in diecasting, as in most other casting, alloys produced from virgin metals are used, but a small percentage of scrapped castings or material cut from castings in trimming them can be used without detriment. In the Stewart Mfg. Company's plant the virgin metal is unloaded direct from the railway cars, weighed and delivered to the raw material stockroom, adjacent to the alloying furnaces. The latter are gas-fired and the temperature is thermostatically controlled and recorded to prevent overheating.

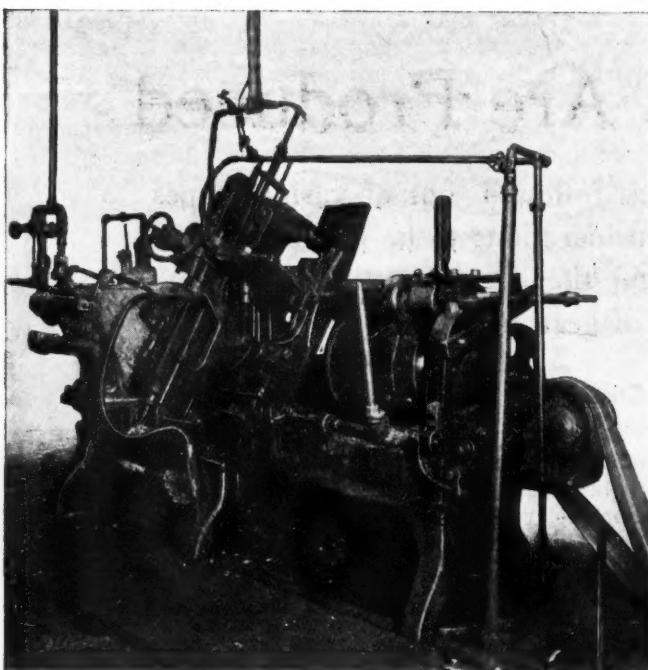
The furnaces used for alloying zinc and tin base alloys are provided with mechanical stirring devices and are arranged to pour directly into metal ingot molds carried on an endless chain conveyor, which, as shown in an accompanying cut, moves slowly over a long table. By the time the molds reach the end of this table the metal has solidified and the ingots are discharged onto trucks. They are stacked and the ends painted a distinctive color to enable proper identification of various alloys and are then delivered either to the diecasting machines or to temporary storage.

Largely because of the higher temperatures required to melt aluminum alloys, these are not cast into ingots, but are delivered direct in molten form in ladles to the diecasting machines. Separate furnaces are used for preparing the aluminum base alloys. These are in the same room with the other alloying furnaces, and closer to the diecasting machines in an adjacent room.

Three general types of diecasting machines are employed: a horizontal type used chiefly for the smaller castings made in other than aluminum base alloys, a ver-



Alloying room in Stewart Mfg. Corp. plant, showing chain conveyor carrying the molds in which ingots are cast



Horizontal type of diecasting machine used chiefly for the smaller white brass and lead and tin base alloys

tical type used for larger castings of the same character, and an aluminum machine used entirely for aluminum-base castings. The three types operate on the same general principle, but are quite different in appearance as will be noted by reference to the cuts. All types have the following essential parts: two members for carrying the two halves of the die, so arranged that the dies can be held closed under considerable pressure during the casting operation and then quickly opened to eject the casting, two core-carriers, usually arranged to move at right angles to the direction of motion of the dies, and a metal pot arranged to be moved up to the die, or the die up to it. Each type has somewhat differently arranged means for controlling the motion of the various parts.

The largest and latest type of machine for other than aluminum alloys is pictured in one of the photographs and the essential elements are shown diagrammatically in Fig. 1. In this machine the lower half B of the die is stationary and is rigidly attached to the frame A of the machine. The upper half C of the die is attached to the sliding head E which is actuated in suitable guides in the frame by the toggle linkage F and piston of the air cylinder, D. When the dies close (they are held together under very heavy pressure) the cores G and H move transversely on the carriages I and J, and assume their proper position in the die. At the same time the metal pot K is moved transversely into such position that nozzle L registers with the gate in the die parting and presses tight against the die. The valve M is then opened, a sufficient length of time is given to allow enough molten metal (contained in metal pot K) for a single casting to enter the chamber N. Valve M is then closed and air under about 300 lbs. per sq. in. pressure is applied to the opening O. This forces the metal in N out through the nozzle L and into the die under high pressure. The die is vented to permit the air contained in it to escape so that the metal entirely fills the open space in the die. The die is watercooled and consequently the metal freezes almost instantly. The machine is then reversed, the metal pot moved back, the cores moved outward, and the dies opened. Into the latter are fitted ejector pins which conform to the shape of the die when the latter is closed but which automatically move inward as the die opens and force the casting free from

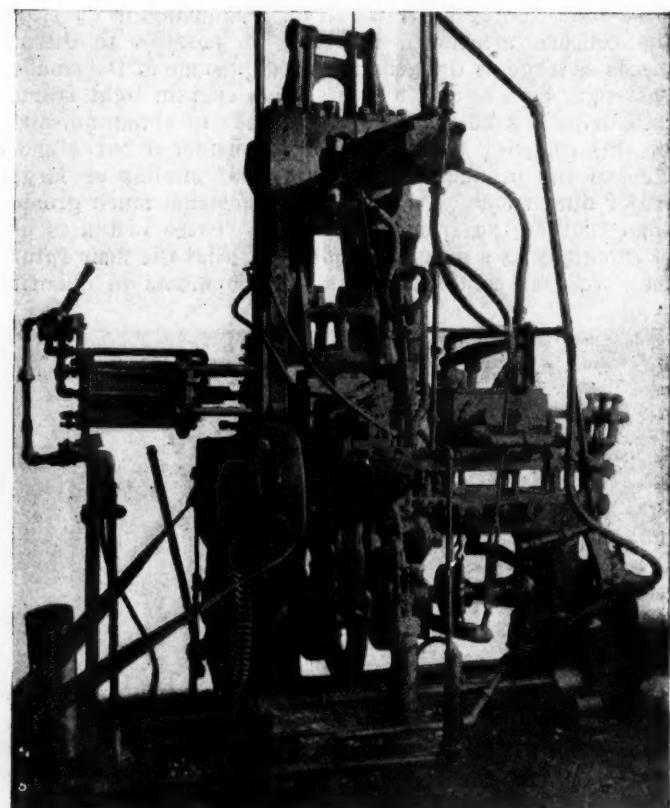
the die after which it is removed by hand. The dies are occasionally lubricated to prevent the metal from sticking. The first casting made after lubrication is usually imperfect and is therefore rejected. In some machines a pneumatic vibratory hammer is used to actuate the ejector pins.

The dies must, of course, separate a sufficient distance to clear the casting and permit of its removal. The type of machine described above is given a rather long stroke for this reason and is used for the deep castings. It will of course be understood that the metal pot must be kept sufficiently hot to keep the metal in the fluid state and at such temperature as to make the best casting. A pyrometer is therefore used in the metal and a gas fire is so regulated as to maintain the desired temperature, and at the same time melt new metal as it is added. The fire keeps the whole metal pot, including the nozzle, hot so that the metal will not freeze and fill the passages through which it enters the chamber N.

It will be noted that the position of the core carriages I and J and the metal pot K is controlled by levers. The position of the latter is in turn controlled by cams (some of which are not shown) while the dies are opened and closed by pneumatic means. The cams are attached to a shaft or shafts which are in turn driven by belts from shafting under the floor. In most cases the entire machine is operated by one man, but in some of the older types of aluminum machines two men are required.

The horizontal type of machine shown in one of the photographs differs but little in principle from the vertical machine. The two halves of the die are, however, cam-operated on slides inclined about 30 deg. from the vertical position. It will be noted in the photograph that the upper half of the die is connected to a bell crank the near end of which is guided by a pin operating in a slotted cam. Cores carried by cross slides can also be employed in this machine, which is often used for die casting bearings.

In case it is desirable to have the metal in the casting



Large vertical type of diecasting machine used primarily for making large white brass castings

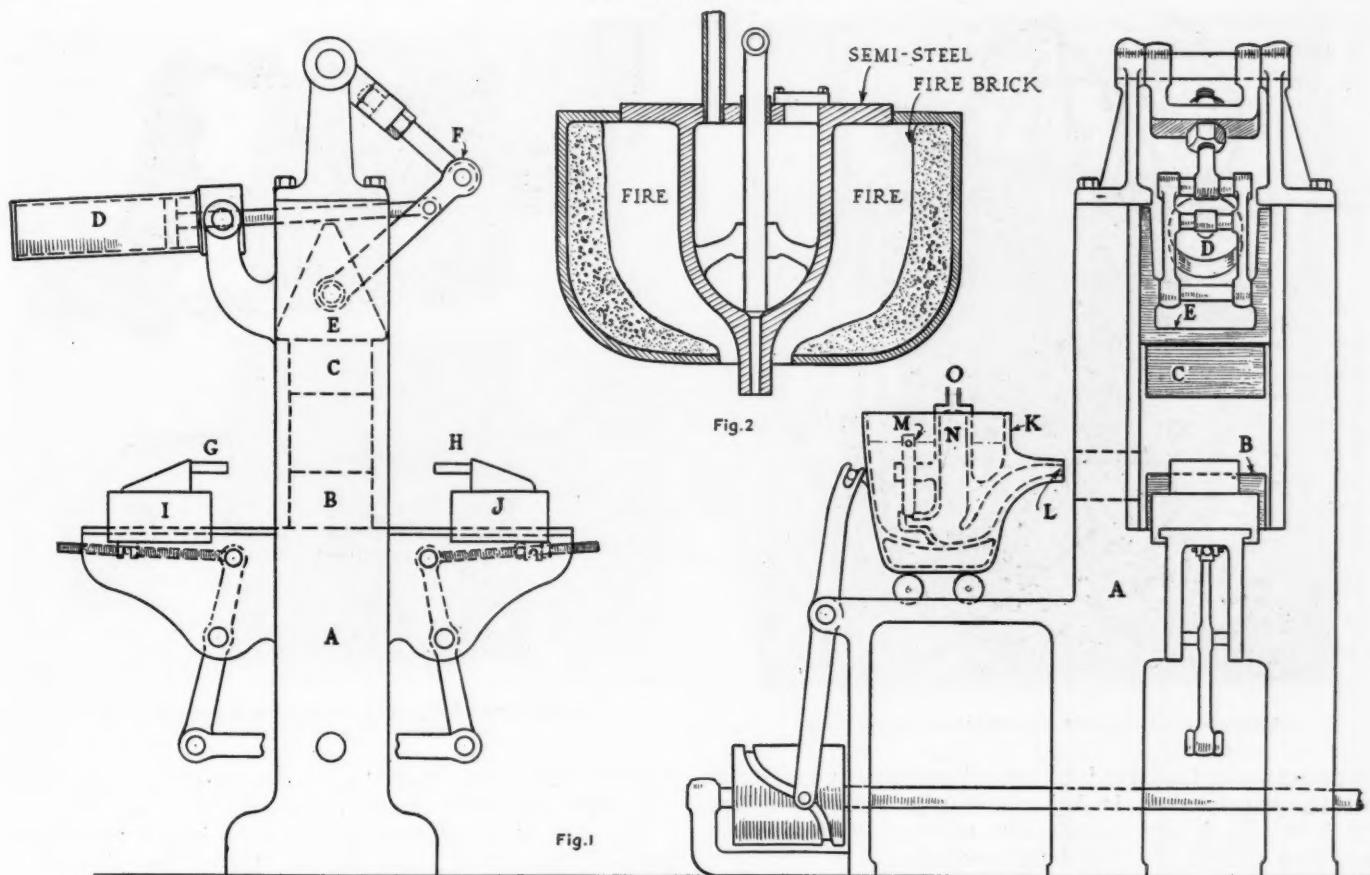


Fig. 1—Diagrammatic sketch of the vertical type of diecasting machine. Fig. 2—Diagram showing type of closed metal pot used on the machines for diecasting aluminum

extremely dense as in the case of a bearing, the pressure on the metal entering the bearing is increased. In this case a piston is employed in the metal cylinder within the metal pot, and this piston is actuated by a second piston of larger diameter on which air pressure is applied. A pressure of about 1,000 to 1,500 lbs. per sq. in. is used in casting bearings.

Casting Aluminum Alloys

The machine for casting aluminum alloys, as shown in the photograph (page 24), is quite different in appearance to the other machines shown but is substantially identical in principle. The halves of the die are pneumatically operated in this case, but instead of moving the metal pot up to a stationary die, the entire head of the machine containing both the die and its operating mechanism, is moved up to a stationary metal pot. The metal pot on this machine is closed and sealed and has but a single chamber, which contains the molten aluminum at a temperature of about 1150 deg. Fahr. A diagrammatic sketch of the metal pot used for the aluminum machine is shown in Fig. 2. It will be noted that the valve is centrally located and seats directly in the outlet of the casting. An air pressure of 300 lbs. is maintained on top of the molten metal, but the latter can flow out only when the valve is open. The walls of the metal pot are surrounded by a fire box lined with fire brick. By keeping the aluminum in a closed container oxidation is reduced to a minimum. The metal pot is filled with molten aluminum by removing the covered plate which is bolted in place.

It sometimes happens that metal intended to be discharged into the die escapes through an opening between the joint made by the nozzle of the metal pot or the die. Since it is under high pressure it may fly in almost any direction, and cause serious injury. Screens are therefore employed to shield operators of adjacent machines and

the operating levers are so placed that the operator will be out of range.

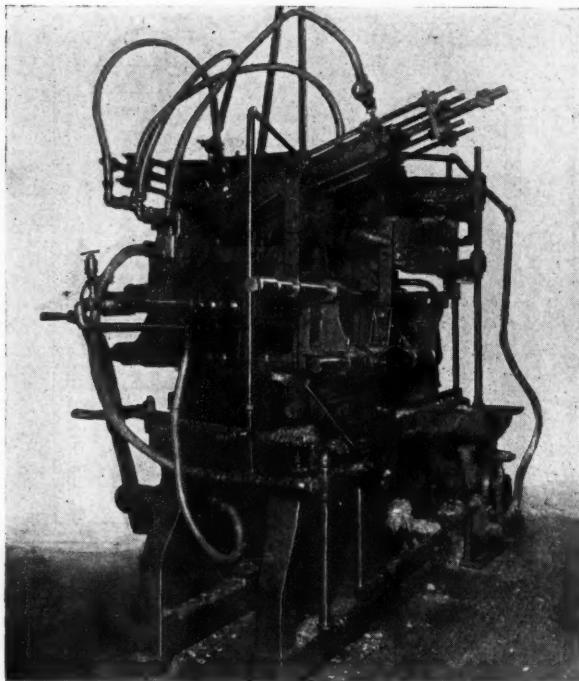
How Dies Are Constructed

A good idea as to the type of die construction employed is given by one of the photographs showing the two halves of a die used in casting the body of a carburetor. It will be noted that there are two large diameter cores operating in a plane parallel to the face between the two halves of the die. A third movable core containing two pins for making holes in the casting is operated in the same plane as the other two but at right angles to them by means of the slotted plate and linkage shown. Opposite to the last mentioned core is the gate through which the molten metal enters the die when it is closed. One of the castings made with this die is shown between the two halves of the die. The piping shown is for conducting water to and from the jacket of the die.

In some dies employed the projected area subjected to a pressure of 300 lbs. per sq. in. is in excess of 70 sq. in. This means that the total pressure tending to separate the two halves of the die is in some cases in excess of 10 tons. For this reason the dies must be held securely in the machine, especially since any springing will not only allow the metal to issue from the die, but will change the dimensions of the casting. This is one reason for employing the heavy type of machine used.

Inspecting and Finishing Castings

From the casting machines the castings are taken to a first inspection department where they are gaged and inspected for cracks or porosity. Some castings are here purposely broken with a hammer to determine first whether any weaknesses due to hidden flaws have developed and second to enable the inspector by observing the character of the fracture to determine whether any weaknesses exist.



Machine used for making aluminum diecastings

If defects are discovered in several castings it is usually possible to determine the cause and correct it at the casting machine before any considerable portion of the product has been ruined. In this department any individual castings which have not filled out or are defective in other ways are thrown out.

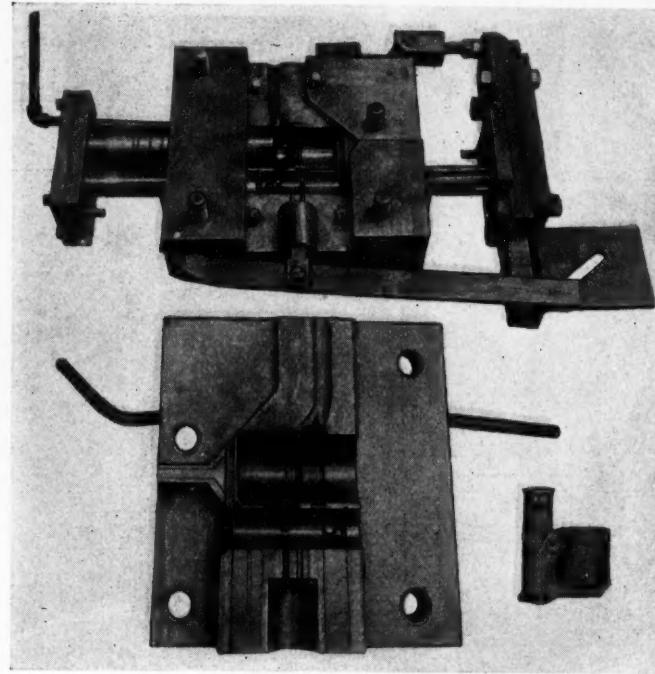
In the first inspection department it is not necessary to break any of the aluminum castings since any flaws which may exist in these are large enough to be seen readily by the inspector.

Castings which pass the first inspection go to the cleaning stock room from which they are issued to workmen who operate the various types of cleaning tools employed. In these operations fins and runners are removed together with any die marks which may remain. In some cases the piece is simply pressed through a finishing die which removes fins and runner, but in some cases a lathe operation, a slotting machine or a band saw is used to good advantage. In one portion of the cleaning department a number of grinding and buffing wheels are employed.

From the cleaning rooms the castings go to a final inspection department where they are finally gaged or given in some cases simply a visual examination. The castings are then sent to the packing room where they are counted by hand and boxed for shipment.

Laboratory Checks

A laboratory in which many chemical and physical tests are conducted is in charge of a metallurgist. It makes not only routine tests on sample castings, alloys and metals used in making the castings, but conducts research work and issues to the factory instruction regarding the alloy to be used and the temperature in which it is to be cast. It is quite largely through the efforts of this department that it has become possible to make many castings which heretofore were considered impracticable. Die materials have also been investigated and many improvements in die materials have resulted. The selection of a proper steel and the correct heat treatment is of course most important. The life of the dies has in some cases been increased from 10,000 castings to 100,000 or more. By so designing the die that parts which wear can be easily renewed it is possible to make dies which will last almost indefinitely.



Photograph of die used for casting the entire body portion of a carburetor

Chrome vanadium steels have been found to resist heat and wear and make excellent material for many dies.

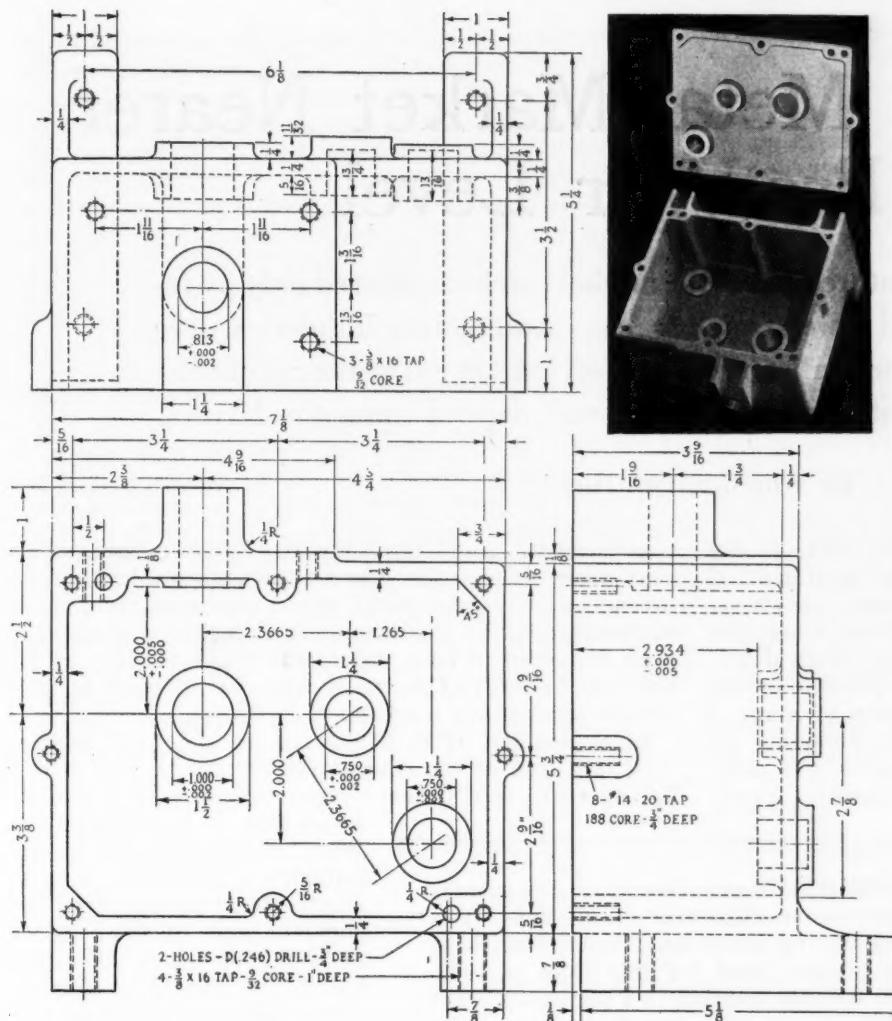
The zinc base alloys called white brass are extensively used in die casting work and are among the cheapest in cost. These alloys contain as a rule from 84 to 92 per cent zinc, 2.5 to 4 per cent copper, 5.5 to 12 per cent tin and 0.3 per cent aluminum. One standard alloy much used by the Stewart Mfg. Co. contains 91.4 per cent zinc, 2.6 per cent copper, 5.7 per cent tin, 0.3 per cent aluminum.

The physical properties of zinc base alloys vary considerably with the section of the casting and temperature at which it is made, as well as with the chemical composition. In general the tensile strength of these alloys runs from 20,000 to 24,000 lbs. per sq. in. They have but slight elongation and are comparatively brittle. The brittleness increases with the age of casting. The scleroscope hardness varies from 16 to 22. The zinc base alloys are not affected by gasoline, but corrode to some extent when exposed to the weather, and especially to moisture. Corrosion is lessened by polishing, and can of course be prevented entirely by nickel plating or lacquering.

Tin and lead base alloys are used chiefly for bearings or in places where ability to resist corrosion is more important than strength. They are usually made in accordance with S.A.E. standard specifications which call for the composition given herewith but can, of course, be made to other specifications when desired.

No. 12 Babbitt		No. 11 Hard Babbitt	
	Per cent		Per cent
Antimony	9.50 to 11.50	Tin	86.00 to 89.00
Copper	2.25 to 3.75	Copper	5.00 to 6.50
Lead	24.00 to 26.00	Antimony	6.00 to 7.50
Iron (max.)	0.08	Lead (max.)	0.35
Bismuth (max.)	0.08	Iron (max.)	0.08
Zinc	None	Arsenic (max.)	0.10
Aluminum	None	Bismuth (max.)	0.08
Tin	Remainder	Zinc	None

The tensile strength of tin and lead base alloys is in the neighborhood of 12,000 lbs per sq. in. but is usually unimportant. Some of these castings are fairly malleable and some much more brittle. Scleroscope hardness varies from 7 to 18 depending largely upon the antimony and copper content. Lead and tin base alloys are usually more



Photograph and drawing of an eleven-pound diecast gearbox, one of the heaviest diecastings made to date. The drawing gives a good idea of the type of construction and the limits which it is possible to maintain

expensive than a zinc base especially when the tin content is high.

The aluminum base alloys usually referred to simply as aluminum are made with a number of different compositions, but the No. 12 alloy which contains 92 per cent aluminum and 8 per cent copper is the standard alloy which is most used. It has a tensile strength of 22,000 to 24,000 lbs. per sq. in., 2 1/2 to 3 per cent elongation. The elongation increases and the strength slightly decreases when the copper content is lowered. This alloy stands shock well, that is, it is not brittle if the copper is kept below 12 per cent. The sclerometer hardness varies from 16 to 22. The usual aluminum alloys are medium in price, and are used extensively by the Stewart Co. for casting

curtain light frames. They stand weathering well, that is, are not easily corroded, unless exposed to alkalis or salt solutions.

A great many other alloys can be used to advantage for special purposes, but the alloys referred to are those used in a large percentage of cases.

In connection with the design of parts to be die cast the following points should be borne in mind:

1. Avoid undercuts on inside surfaces so far as possible.

2. Allow, in the case of aluminum, for a draft of 0.005 in. per in. of length and diameter on cores. On white brass cores allow a draft of 0.002 to 0.003 in. per in.

3. Uniformity in section tends to prevent cracking. When thick and thin sections are necessary the transition from one to the other should be as gradual as possible.

4. Allow fillets whenever possible. Even a very slight fillet is better than none at all.

5. The minimum thickness of section practicable varies considerably with the area of the section. One-sixteenth in. is usually the practical minimum in the case of aluminum and 1/32 in. in white brass, but thinner sections have been cast in some cases.

6. The minimum size of hole which it is practicable to cast in aluminum is about 1-16 in. when the hole is not more than 1/4 in. deep or 3-32 in. for hole 1/2 in. deep. In the case of white brass a 1-16 in. hole is practicable if the length does not exceed 1/2 in., while a 3/32 in. hole of almost any length can be cast readily.

7. The use of knife edges should be avoided.

8. In the case of aluminum some dimensions can be held to ± 0.0015 in. On thickness the limits are usually about ± 0.0015 in. The corresponding tolerances for white brass are ± 0.0005 and ± 0.001 in. Both internal and external threads can be cast, but for close work these must usually be chased. In the case of a female tread the core is withdrawn by unscrewing.

Inserts can often be used to advantage. Their surface should be grooved, knurled or roughened in case it is desired to anchor them permanently in the casting. Iron, bronze, graphite and other inserts have been successfully used. Bushings can be die-cast in place or pressed in after the casting is completed, but in some cases a bearing directly in the metal without bushing is employed.

Frame Standardization Under Way

REPRESENTATIVES of passenger car frame manufacturers recently got together and determined to undertake the standardization of passenger car frames, as it is felt that such standardization would be of material assistance to passenger car designers and to frame manufacturers. Information in reference to present frame practice is to be obtained as a basis for the standardization involved, a questionnaire requesting this information having been sent out to all passenger car manufacturers.

The standardization of frames will be of special assistance to many frame manufacturers because passenger car manufacturers are often willing to use a frame for which the frame manufacturer has the necessary tool equipment in case the design conforms reasonably well to their requirements. The adoption of definite frame standards will result in an increase in the number of such orders to the mutual advantage of both frame and passenger car manufacturers. This work is being undertaken by the S. A. E. Standards Committee.

Automotive Metal Market Nearer the Pre-War Level

Price reductions that featured the 1921 market can be furthered only by increased production and lower freight rates. Automotive Industries were instrumental many times in keeping the steel market out of the rut of idleness. Review shows that future conditions will depend upon the buyers.

By Wm. Crawford Hirsch*

THE year 1921 was a necessary evil. This is the verdict which reflects the majority sentiment of buyers, as well as sellers, of automotive steels, pig iron and non-ferrous metals. The former are disappointed because the year failed to bring forth downward revisions to the extent of restoring pre-war levels, which at the outset of 1921 was the dream of many a keen purchasing agent. The sellers are shedding no tears at the passing of a year in which periods of utter stagnation of demand recurred all too frequently; a year in which freight rates and taxes, from the oppressive burden of which relief had been promised time and again, remained at practically war levels.

And yet much was accomplished in 1921. That the expectations of neither producers nor consumers were fulfilled merely emphasizes the fact that 1921 was a link in the chain of readjustment which is by no means completed. Last year's record of the iron, steel and non-ferrous metal markets, however, furnishes ample proof that 1921 was a much stronger link in this chain than was 1920, and that readjustment gained such headway as to bring within sight the end of the period of subnormal activity and the dawn of that phase of the cycle in which re-establishment of the equilibrium between demand and supply will bring about natural stability of values. Conceding, therefore, that 1921 was a necessary evil, it was so rather in the sense of a thunder shower that clears the atmosphere than of a havoc-wreaking upheaval in the ferrous and non-ferrous metal markets.

The year opened on a pig iron market in which values still suffered to a great extent from the adipose of war prices, No. 2 foundry being quoted at \$32, which, although low when compared with the \$50 price at which sales had been made four months previously, was, nevertheless, looked upon with more or less suspicion by consumers. Automotive foundries were all the more reluctant to commit themselves for any representative tonnages at quoted prices, as it was an open secret in the trade that a Michigan automotive interest, owning and operating his own blast furnace, frequently supplied parts makers holding contracts from him with pig iron at considerably lower prices than those quoted in the

open market. Amid the distrust of melters and, as the year grew older, under the sledgehammer blows of the falling away of the demand, prices weakened from month to month, until by midsummer blast furnaces would have been delighted to book orders for No. 2 foundry at \$20 and less. Scores of furnaces went out of blast in mute protest against the market's vicissitudes.

In September, 1920, 319 furnaces had been pouring forth pig iron at the rate of 100,000 tons a day, buyers falling over one another to secure as much of the output as possible at \$45 to \$50 a ton. What a different picture the industry presented a year later! Only 69 furnaces had survived and, of their output of 30,000 tons a day, the bulk had to be stored in furnace yards until buyers would consent to come forth from their hiding place.

The weekly market letters of the leading pig iron sellers read like funeral sermons, frequently so lugubrious that they even withheld all hope of the market's resurrection. As is usually the case, when matters looked darkest the turn for the better came. Buyers still proceeded cautiously. They did not order large tonnages. In fact, most of them continued to buy from hand to mouth, but in the aggregate this hand-to-mouth buying yielded orders that enabled those blast furnaces which had continued in operation to cut down their accumulations and to maintain production at a satisfactory rate. In fact, by November pressure on the available supply and the facilities of the furnaces in blast had become such that idle plants began to lay plans for a resumption of productive activity.

The end of the year found the price situation in somewhat plastic shape. Automotive foundries were offered No. 2 foundry at \$19.50, Buffalo or Chicago, and malleable at the same price level, Chicago, or \$20, valley basis. In other words, pig iron prices at the close of 1921 ruled about 40 per cent lower than at the year's opening. Considering that there has been only a modest reduction in the freight rates on the raw materials which enter into the making of pig iron, a factor that makes up more than one-third of prevailing market levels, the pig iron market's course in 1921 has been truly expressive of the trend toward readjustment. Of paramount influence on a further downward readjustment of prices would be, of course, a drastic pruning down of freight rates in 1922. Next in the importance of its effect on

*Editor Raw Materials.

market conditions will be the attitude of producers and marketers. Demand has not yet assumed such proportions as to bring sellers face to face with the temptation of forcing the market higher by manipulative tactics, such as have often been employed in years gone by, 1921 having formed a notable exception in that respect. Perhaps last year's lessons have not been lost. Pig iron producers may at last have learned that a stable market is preferable to one of such wide fluctuations as those which were noted between September, 1920, and December, 1921.

Automotive foundries can greatly further stabilization of the market by a rational buying program. Never has there been greater need for this than there will be in 1922. Chronic bargain hunting in a pig iron market in which buyers have things to themselves is bound to react to their detriment when the tables are turned. Price stabilization results largely from an equitable distribution of the demand over the longest possible period. Although this ideal is not possible of complete attainment in the automotive foundry industry, much can be done to eliminate the frequent spurts of intensive rush demand which invariably furnish an incentive to runaway market conditions. Now, it would seem, is the time when automotive pig iron consumers could profitably ponder this problem, because the market just now is free from artificial conditions and consumers are still its masters instead of its slaves, as they were in the summer and fall of 1920.

How much of the country's steel production was consumed by the automotive industries in 1921 is a question no more to be answered by an estimate of the tonnage it represented than in preceding years. Those who would minimize the importance of the automotive industries in the steel market will always trot out in answer to this problem the hoary opinion that in the manufacture of an annual output of, say, 2,000,000 automotive units, only between 3 and 4 per cent of the country's aggregate output of rolled, finished steel is consumed. This sort of calculation comes within the category of the famed trinity of falsification: "Lies, d—— lies, and statistics." It is utterly unfair to take automotive sheets which sell at \$80 to \$90 a ton and bunch them with rolled, finished products on the order of plates and beams which sell at \$30 a ton. The only half-way fair estimate would be to figure the percentage of gross revenue derived by the steel industry from automotive manufacturers, and, inasmuch as none of the steel producers reports the value of his output, properly segregated as to the industries into which it enters, this is a statistical feat which cannot be accomplished.

Time and again, however, during the last year automotive buying lifted the steel market out of the rut of utter idleness. In fact, the improvement in the demand that began to make itself felt during the end of the third quarter was solely due to the placing of more liberal orders by automotive interests.

There is no gainsaying the fact that of all the steel products none was more frequently in the limelight than were sheets. Even those who make light of the automotive industry's importance as a steel consumer admit that it absorbs more than one-quarter of the country's total sheet production, and there were at least two periods in 1921 when sheet mills were working almost exclusively on orders from the automotive industries. If

accurate records were available, it would probably be found that what sustained sheet mill operations in the fall of the year was the support emanating from the automotive industries, which frequently figured to an extent exceeding 50 per cent of all classes of consumers in the sheet market.

It may be put down as an axiom based upon the experience of the last three years that the automotive industries are the bell-wethers of nearly all buying movements in the steel market, especially of those which follow protracted periods of idleness. Curves showing the uptrend of automotive operations are invariably matched by curves showing a like quickening of steel buying, the latter preceding the former by the brief interval necessary to set steel shipments moving from mill to automotive consumers. As a rule, buying by automotive plants acts as an incentive to consumers in other branches of manufacturing to cover their steel requirements.

Moreover, it will be well to bear in mind the inadequacy of the methods used by steel statisticians in computing automotive consumption. They proceed on the basis of the country's passenger car and motor truck output, losing altogether sight of the thousands of tons

of steel that go into garage construction, into gasoline and oil containers, pipe, etc., and the many implements and replacement parts the steel entering into which is never credited to the automotive industries. A buying flurry, such as recently took place in tubular goods, is always considered without the slightest reflection as to the share which the automotive industries had in causing it.

One of last year's outstanding conditions in the steel market was the frequent change in its leadership. At numerous stages the chief interest assumed a passive attitude when it came to dealing with a drifting market, permitting the independents to set the pace in price reductions as well as advances, and refraining from changes in its official prices until after the situation had sufficiently cleared to reveal the reaction of market changes on consumers. It was, however, an open secret in the trade that during those periods, when independents were disposed to slash prices so as to enhance their rate of operations, the corporation extended the utmost protection to its regular customers and permitted no desirable orders to get away from it.

During the worst of the midsummer slump the steel market had at one time the appearance of thorough demoralization, even some of the larger independents admitting that they were ready to book orders at any price the buyer might name, but adding woefully that there were no buyers at any price. Expectations of a downright price war came to naught, however, as the result of the diplomatic handling of the situation by the steel industry's leaders. There is an entirely false conception abroad that a price war benefits consumers. As a matter of record it may be stated that buying is always at a low ebb while prices go tumbling. A declining steel market resulting from lessened costs of production is one thing, while a market devoid of all semblance of soundness, in which producers cut prices for no other purpose than to injure their competitors, is quite another.

A stable market is, after all, the one most conducive to healthy activity. Downward price adjustments announced by the chief steel interest in tubular goods and

STEEL prices are approximately 33 1/3 per cent nearer pre-war levels than they were at the beginning of 1921, and on January 2, 1922, the price was only 25 per cent higher than the ten year pre-war average. The conclusion must be drawn that the year 1921 was a truly remarkable one in the reconstruction of the steel market on a sane and healthy basis.

wire products shortly before the year's end were apparently for the purpose of enhanced stability, and liquidation of war prices, while by no means finished, appears at the outset of 1922 to have reached a pass where stability is possible, subject, of course, to such further downward price adjustment as a lowering of freight rates, taxes, overhead and further economies in production costs will make possible.

Let us see now how far the automotive steel market traveled last year along the road to normal conditions. Take, for instance, cold-finished steel bars or screw stock. Late in December this product was quoted at 2 cents base, compared with 3.60 cents at the beginning of the year. In the same period hot-rolled bars (which are the raw material from which screw stock is made) declined from 2.35 cents to 1.50 cents. The decline of \$32 a net ton in the price of screw stock denotes, therefore, in addition to the \$17 drop in the cost of the raw material, a \$15 decline per net ton in conversion cost. Hot-rolled strip steel opened the year at 3.30 cents and cold-rolled at 6.25 cents, Pittsburgh. At the year's close hot-rolled was quoted at 2 cents and cold-rolled at 3.75 cents, the change implying a saving of 40 per cent to the consumer.

The Sheet Market

Of more than passing interest to the automotive industry is the record rolled up by the sheet market during the year. Sheet bars, the semi-finished form of steel from which sheets are rolled, wavered early in January somewhere between \$42 and \$47 a ton. At the year's close they could be bought at \$29. Assuming that in January sheet bars were obtainable at \$42 and at the close of the year at \$29, there was a decline of 25 per cent.

Let us see now what the course of prices for sheets was. No. 28 black opened the year at 4.35 cents, Pittsburgh, and closed the year at 3 cents, a decline of 31 per cent. No. 10 blue annealed descended from 3.55 cents early in January to 2.25 cents late in December, a recession of approximately 37 per cent. The average decline in sheets for the year may be put down at 35 per cent, as against a decline of only 25 per cent in sheet bars, the difference of 10 per cent representing the proportionately greater reduction in conversion costs than in the cost of the raw material. This would tend to show that the non-integrated sheet mills, most of which cater to the automotive industries, have set their house in better order than have the semi-finished steel producers.

A fair idea of the changes that have come over the alloy steel market may be gained from a brief consideration of the course of values in the nickel, chrome and vanadium markets, the three alloys that enter chiefly into automotive steels. Nominally the price of nickel has not undergone very sharp revision. The quotation early in January was 43 cents and in December 41 cents, taking ingots as a basis. Unfortunately, the outlet for nickel has been considerably curtailed.

Aside from the effect of the general slump in the demand for non-ferrous metals and the heavy offerings of resale nickel-steel, mostly war legacies, the naval disarmament program affected the immediate future of nickel more adversely than that of any other metal. Diminished consuming avenues may, for a time at least, render sharp price reductions impossible. The overhead on the impaired sales quota will be the same as it was when the industry was in its heyday, and it will have to be borne by the curtailed output.

In the course of time nickel will find its way into new uses, and, as consumption increases, there may be a possibility of economies which will come the buyer in good stead. For the time being the market may be

expected to continue a nominal affair, with desirable orders, as a rule, coming in for concessions from quoted prices. Late in December there were still weighing on the market a number of resale tonnages of nickel steel, one of these (S.A.E. 2330) being offered at 2 cents, f.o.b. Chicago warehouse, far below the market for very new material.

Ferrochrome, which throughout 1920 sold at 18 and 19 cents for 60 to 70 per cent chromium and 6 to 8 per cent carbon of domestic origin, was offered at the end of 1921 at 14 cents. Imported alloy, containing 6 to 8 per cent carbon, held at the beginning of 1921 at 16 cents, ex store, could be had at the year's close at 10 to 11 cents. Chrome ore, 50 per cent chromic oxide guaranteed, sold at the end of 1921 at 40 to 45 cents a unit, as compared with 55 to 60 cents per unit at the beginning of the year.

Ferrovanadium, 30 to 40 per cent, declined from \$7 a pound, obtained at the year's beginning, to \$4.25 to \$4.75 at its close.

While on the subject of alloy steels, it may not be amiss to record the fact that, from the point of view of metallurgical progress, the year just closed has been a keen disappointment. If there was one hope which automotive steel consumers had a right to entertain, as the result of the sacrifices they made during the war, it was that the impetus which the great conflict had given to the development of alloy steels would lead to uninterrupted research and progress along the line of developing steels that would steadily diminish in weight and increase in tensile strength and in their ability to withstand shocks and stresses. The alloy steel industry has passed through a trying year, and the heavy draft made on the ingenuity of producers to overcome the difficulties of financing their enterprises and keeping them afloat apparently sapped their strength, leaving them little zest for expensive research work in their laboratories. In this respect 1922 should bring a decided change. After all, the automotive industries want better rather than cheaper steel.

There is a gratifying sentiment in evidence in the steel industry that 1922 will exact from every man engaged in it the very best that is in him. The metallurgical laboratory should be the first department of the mill for translating this worthy resolution into still more worthy action.

Nearer the Pre-War Price Level

To return to consideration of the year's price record in the steel market, there are bound to be those who, as they behold the year's closing levels, will declare that we are still far from their ideal of pre-war values. This argument may be answered by stating that we are approximately 33 1/3 per cent nearer to pre-war steel levels than we were at the beginning of 1921, and that price levels obtaining on Jan. 2, 1922, were approximately only 25 per cent higher than their 10-year pre-war average. When one bears in mind that, as the result of savings in freight, taxes and the general cost of doing business, further reductions are not precluded and, moreover, that there are still scores of basic commodities which rule in price considerably higher than 25 per cent above their 10-year pre-war level, the conclusion must be reached that 1921 has been truly a remarkable year in the reconstruction of the steel market on a sane and healthy basis.

At the beginning of last year tremendous tonnages of non-ferrous metal scrap resulting from the manufacture of munitions remained to be absorbed. In fact, ever since the signing of the armistice, which was followed shortly afterward by publication of an inventory of

surplus metal and scrap held by the Government, there has been coming into the market at periodical intervals tonnages of non-ferrous scrap which somehow or other had eluded the eyes of those who were supposed to have made a complete inventory of the supply. These surprises are not yet over, and at the beginning of 1922 the Government is arranging further sales of such scrap material.

In addition to the domestic scrap accumulations, the American market had to absorb part of Great Britain's war scrap, although most of this material is supposed to have been shipped here solely for the purpose of refining. With this millstone hanging around their neck, in addition to the long-continued absence of domestic consuming demand for virgin metals of all kinds resulting from the general business slump during midsummer, American producers, with the possible exception of lead refiners, had a hard road to hoe last year.

The large copper producers took the bull by the horn and early in the year decided on a shutdown of their mines and many of their smelters. The aluminum indus-

try also practically suspended production for a time, European competition flooding the American market with heavy tonnages of aluminum at the first sign of a slight recovery in the demand.

Zinc producers recognized early in the year that their sole salvation would lie in a curtailment of output and co-operation to the end of preventing selling pressure. Tin prices declined to record-breaking low levels as the result of the glut of supplies in the East and demoralized exchange conditions. With the sole exception of aluminum, however, all of the metals recovered during the closing months of the year and, having safely weathered the worst year in the non-ferrous metal markets, producers have mapped out a program of gradual resumption of mining activities and smelting operations in 1922.

Aluminum.—Although the sole domestic producer's quotation at the end of January, 1921, stood blithely at 28c. for virgin ingots, 98 to 99 per cent, it was manifest from the year's outset that the American producer's official quotation was a strictly nominal affair. In fact, the price schedule of the Aluminum Company of America was quoted from the beginning of the year subject to revision according to daily conditions. On Feb. 7 the company's quotation was reported to be 28.20c., an advance of 1/5c., the reflection of a temporary rise in the "outside" market fed from the year's start on imported metal which was offered 3c. below the American producer's quotation and, when sellers could not realize 25c. they pruned their price down to 24c. This paring of prices by sellers of foreign aluminum continued to be a progressive affair becoming the more pronounced as the decline in demand made itself felt. Fraction by fraction prices were hammered down by the flood of German, French and other European metal that poured into the United States until 17c. was considered a good price and sales at below this level were reported. Meanwhile the domestic producer had reduced his quotation to 24.50c. and late in November, after it had been definitely understood that the American interest was no longer permitting foreign competitors to get away with desirable business, the official schedule was revised downward to 19c. for 98 to 99 per cent pure virgin ingots. The quotation for sheets was put at 35c. for 18 gage and

heavier flats and at 30c. for coils, while No. 12 alloy (aluminum-copper) was quoted at the same price as virgin ingots, 98 to 99 per cent pure. These quotations, however, continued their nominal character as imported metal was offered up to the end of the year to 1 to 2c. lower, according to country of origin.

Aluminum prices closed the year at not far from one-half of what they were during the war and one-third lower than they stood at the year's beginning. At the close of the year there seemed to be somewhat of a slowing up in the enthusiasm with which the Germans had for many months dumped aluminum onto the American market. Not that they had lost their eagerness to continue as factors in the American aluminum market but they seemed to recognize the folly of slashing prices merely for the sake of slashing them. A policy of permitting the American producer and those of other countries to set the pace and then to cut just sufficiently under their quotations to permit of the sale of what tonnages happen to be available for export to the United States, seems to have been adopted by the German aluminum exporters during the closing months of last year.

After all, the aluminum market's future is wrapped up in whatever tariff legislation is enacted in 1922. The Fordney bill provided a 5c. per lb. duty on ingots and alloys and 9c. per lb. on plates, sheets, bars, rods, circles, disks, blanks, strips, rectangles and squares. The existing rates of duty are 2c. and 3½c., respectively. Whatever tariff

FURTHER reductions in steel prices can be brought about in but two ways; a material decrease in freight rates and an increase in production. Increased steel consumption in 1922, therefore, portends lower prices. This increase, however, should be spread out over as long a period of time as possible, as sudden increases would have a demoralizing effect.

law is finally adopted, the rate of duty on aluminum may be expected to be somewhere between the existing one and that proposed in the Fordney bill. If it is wisely adjusted it will prevent dumping, which would be disastrous to the American industry, and at the same time afford to American consumers, among which the automotive industry is the most prominent, the benefit of a continuance of healthy competition by the foreign producers in the American market.

Copper.—It was a decidedly sick condition in which the copper market found itself at the beginning of 1921. What little artificial support had been extended to it in the preceding year vanished over night and the quotation noted in January for electrolytic, 12.85c., failed to express adequately the disheartening position of the red metal, save when compared with the opening price of the preceding year, which was 19c. Domestic demand was negligible from the very beginning of the year, brass rolling mills and foundries being loaded down with surplus accumulations of both primary and second metal. Exports were difficult to finance until the Copper Export Association succeeded in hypothecating 400,000,000 lb., obtaining thereon (its notes being part of the collateral), a loan of \$40,000,000 from a syndicate headed by the National City Company and Guaranty Company.

But the securing of this loan failed to help matters materially. Domestic demand kept going from bad to worse and England was not in the least interested in offerings while business with Germany, hungry as that country was for copper, became more and more difficult as the result of the falling mark. In March 18 large and small producers decided to shut down all operations at mines and smelting plants and curtailment of the output began in April, by which time the market for electrolytic had declined to 12.50c. After a short-lived and very modest recovery, the business depression of

August caused the market to break to the lowest level since 1914, electrolytic being offered at close to 11.50c. The turning point had now come and improvement went on apace until 13c. was chalked up early in November, the market being subsequently lifted to very close to 14c., which price level was actually the producers' end-of-the-year quotation for deferred deliveries.

At the beginning of the year it was estimated that there were 1,000,000,000 lb. of undigested copper in the United States. This "billion-pound copper surplus" has been worked down during the year to approximately 600,000,000 lb., of which 300,000,000 lb. are held by the Copper Export Association. About one-half of the 300,000,000 lb. which remain to be absorbed in the home market is available in the refined state, the other half being blister copper awaiting treatment.

When the copper market's firmament looked gloomiest the industry busied itself with plans for broadening copper consumption by promoting the use of the metal in many different products heretofore made of other metals. There were reports that the New Cornelia Copper Co. of Ajo, Arizona, was working on the direct production of automotive radiators and gaskets from the electrolytic copper solution. Other producers carried on experiments with a view to producing other automotive parts from copper sulphate solutions, but all of these are either still in an embryonic stage or else have been abandoned.

The fact of the matter is that when the copper market was prostrate on its back many in the industry turned in their despair to countless projects, some practical and others utterly visionary, all, however, centering in the aim to force an increase in the consumption of copper.

Among the large producers, the sentiment that the time had arrived when they must have more close control over their product in its progress from the mine into the finished copper or brass product crystallized into action in at least one noteworthy instance, the Anaconda Copper Mining Co. having announced in December its intention of absorbing the American Brass Co. If the final financial preliminaries to this merger succeed, the world's largest copper producer will also be the world's largest producer of finished copper and brass products, a transformation in metal market conditions which deeply concerns the automotive industry, this all the more so as late in the year rumors of further mergers between Connecticut valley brass interests and other copper producers were in circulation. Combinations of this kind can be made of the greatest economic benefit to the consumer. A plant which is self-contained in its supply of raw material can always work to greater advantage than one dependent upon the vagaries of the open market. It is quite possible that the change which is now coming over the copper industry, making of it, as the steel industry is to-day, a producer of finished material instead of merely the purveyor of raw material, will eventually lead to the greater use of brass and copper parts in the automotive industries. Certain it is that, once these powerful interests get their full stride as sellers of finished copper and brass products, which may take a few years, they will permit nothing to stand in the way of developing the consumption of their products in automotive construction. Automotive consumption of copper and brass in 1921 made up a far greater percentage of the industry's total output than in former years. This was, perhaps, not so much due to greater requirements by automotive consumers as to the diminished needs of many other copper and brass consuming industries which were practically absent from the market throughout the year.

Tin.—The Straits tin market ruled at around 38c. during the first month of the year and by March had declined to 27.50c. Following a short-lived upward spurt, the market declined gradually until in September Straits tin could be bought at 25.50c., the lowest price level recorded in a score of years. This was followed by a gradual recovery in values due in part to the metal's improved statistical position and speculative support in London and Singapore and in part to the improvement in the market for sterling exchange. When the pound sterling crossed \$4, the rise in tin prices became accentuated and the year's last week found the market fluctuating between 33c. and 33½c. The market was jumpy throughout the year as the result of the frequent seesaw course of the exchange market. At the close of the year the tin market showed the same evidences of having left the worst behind as did the copper market. In spite of the fact, however, that most of the professional tin traders are bullish in their sentiments, consumers are proceeding with caution which is always becoming in so highly speculative a market as that for this metal.

Lead.—No metal displayed greater price steadiness in 1921 than did lead. Opening the year at 4.87½c., East St. Louis, the metal never went below 4c., closing the year at 4.40c. Storage battery manufacturers were consistent buyers throughout the year, but the real prosperity which lead frequently enjoyed while other metals were in the doldrums was due to the demand from pigment makers. At the end of the year output and consumption appear to balance nicely.

Antimony.—For the greater part of the year the antimony market was lifeless. The price for Chinese metal, duty paid, declined from 5.25c. in January to 4.45c. in September, 4.50c. being the year's closing quotation.

The Outlook for 1922

Market prophecies are not only useless but impossible. It is permissible, however, to point out certain guide posts that may help in the framing of a correct buying policy. Both in the steel and copper industries the trend is toward further consolidations for the purpose of more economic production. The question uppermost in the consumer's mind, especially with reference to the various mergers in the steel industry, that were the subject of more or less trustworthy reports in the closing weeks of last year, is whether their consummation would result in a lessening of competition in the steel market. Confining consideration of this problem solely to its effect upon market conditions in 1922, all indications point to healthy competition regardless of whether these mergers materialize or not. The success of whatever consolidations there are will be measured by the increase in the business done by them over what was the aggregate amount of business done by the individual constituent companies before they were unified. To accomplish such increases in sales will necessitate the contesting of every foot of ground with the competition. This activity may not find expression in a wide disparity between quotations of the competing interests, but it will nevertheless exert an indelible influence upon the formation of market values. A market may be competitive and yet far from ragged. The all important benefit accruing to the buyer from competitive conditions is their acting as a preventative against unwarranted advances when demand turns brisk.

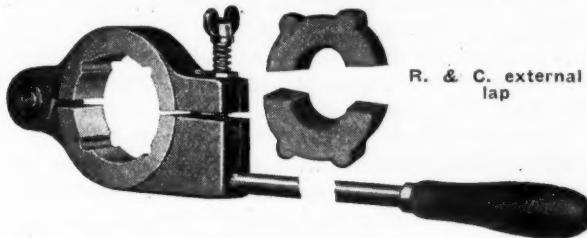
The last few years brought in quick succession steel markets in which buyers, especially those in the automotive industries, drove prices up on themselves by bidding against one another, followed by a "buyers' strike" in which consumers spontaneously turned their

backs on the market. The buyer's true interest in 1922 lies in quite a different direction. The steel industry has reached a point where, save for a reduction in freight rates, it can cut prevailing market levels perceptibly on one condition only—a marked increase in operations. If the rate of operations can be enlarged so as to approach capacity more nearly than it did in 1921, numerous economies can be effected and the pro rata share of overhead per ton of finished steel will be proportionately lowered. It is the consumer who has it in his power to make possible this condition. Increased steel consumption in 1922, therefore, portends lower prices. Of course, if this enlargement in the demand should materialize by fits and starts, there is danger of its creating the impression that it exceeds capacity production with the result that prices would temporarily

reflect this situation. If the increased demand, however, is spread as much as possible over the entire year, thereby enabling the mills to operate at a fairly satisfactory rate all the year around, the effect on market values will assuredly be in the buyers' favor. The astute steel buyer will constantly bear in mind that every increase of mill operations from their present fractional rate to capacity lowers production costs and if the trend of values does not reflect this condition it is either due to abnormally large shipments being exacted in any one month, causing producers to fear that the rate of operations will decline perceptibly following the satisfying of this demand, or else that artificial influences are at work. At the outset of the new year it looks as though there would be less danger of the latter condition in 1922 than in years gone by.

Lapping Outfits for Cylinder Bores and Crankshaft Bearings

THE call for precision work in quantity production during the recent war was responsible for important strides in manufacturing processes. Particularly did it bring to the front the lapping process, which for years had been used in finishing precision gages. In a few instances lapping had been used for finishing the working surfaces of internal combustion engines, but most people



R. & C. external lap

regarded it as impractical for this purpose, because of the crudeness of the tools made for lapping, and the meager knowledge existing regarding the correct abrasive.

The R. & C. Lap Co. has developed a line of standardized laps with interchangeable and replaceable shells. The laps are made for both external and internal use, in sizes from $\frac{1}{4}$ in. up. It is claimed that the design of the lap and the use of a standardized abrasive render highly skilled labor and lengthy experience unnecessary. The replaceable shells are supplied in two grades, the use of which depends on the speed of cutting desired and the type of work.

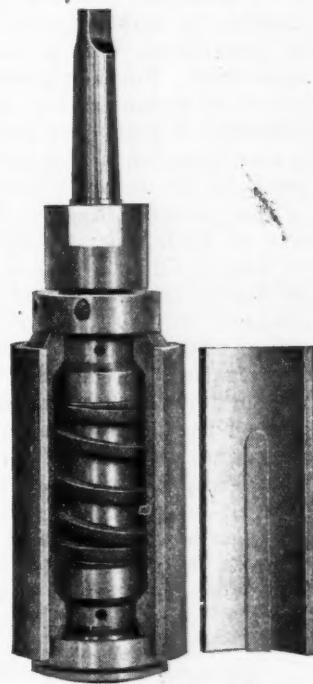
As illustrated, one section of the shell of the internal lap has been removed to show the construction. The lap consists of a floating shank and an expanding device for adjusting the size, as well as for taking up the wear of the soft metal shell which is charged with abrasive. It is claimed that while the lap is being expanded the diameter is kept constant over the whole length, assuring a true bore, free from bell-mouthing and taper.

Among engineers the impression has gained ground that in every lapping operation some of the abrasive remains embedded in the surface being lapped. We are informed by the manufacturers of this device that conclusive tests have shown it to be impossible to charge the surface being lapped if the lap is made of softer material. The R. & C. lap shells are made of metals which are softer than the surface to be lapped, thus overcoming the objections of the split-piston and similar laps. The abrasive becomes embedded in the softer lap shell, rather than in the surface being lapped.

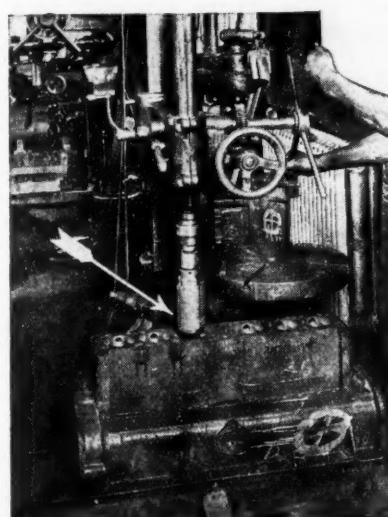
Another advantage claimed for lapping—which, by the way, is used for finishing the cylinder bores of some of

the highest grade cars—is that it renders unnecessary the "running in" of new engines or engines to which new pistons have been fitted. Purchasers of cars are ordinarily cautioned to drive slowly the first 500 or 1000 miles to prevent seizing of the pistons or bearings while they are still imperfectly "worked in." This precaution is rendered unnecessary by lapping.

In crankshaft manufacture a tolerance of plus and minus 0.0005 in. is generally allowed on the crankpin and main bearings. Frequently, however, inspection departments find crankshafts that measure an additional 0.0005 in. above or below the limits given. One way of avoiding scrapping such oversize parts is the adoption of selective assembly.



The R. & C. cylinder lap



Manner of lapping cylinders with R. & C. lap

This, however, impedes production, and if any of the specially fitted parts become separated or mislaid, still more time is lost. The R. & C. external lap was designed for use in lapping crankshaft bearings. The crankshaft bearings are left 0.0001 in. oversize, and are lapped to size within 0.0001 or 0.0002 in. The connecting rod bearings are finished by means of hardened and lapped plugs and are then absolutely interchangeable, it is claimed.

Leadership Necessary in Executive Supervision

Proper distribution of authority and development of understanding in individuals constitute major problems in modern industrial organization. The supervisor must develop leaders beneath him; he cannot rely merely upon centralized orders. Subordinates must be given responsibility.

By Harry Tipper

NOT very long ago, in a conversation with an executive of the largest company in a certain line of business, this executive admitted that it was impossible for this company to compete, quantity and quality considered, with a company of medium size in the same field. Further questioned, and asked for the reason of it, he stated that in his opinion it was due to the difficulty of getting a decision, the difficulty of moving in any direction, and the difficulty of instituting improvements to the organization with any celerity.

These are all human difficulties and arise from the lack of leadership and the incapability of coordinating all human differences and human necessities in so large an organization. One of the younger executives of the company having ten or twelve subsidiary companies, stated that there had been a change of policy in the organization, so that the tendency to build up a central system for all the companies was being discarded and instead the present policy was to allow a greater latitude and individuality of the separate subsidiaries. Asked why this was the case, he remarked that it was possible to get in a single factory a compact group working together under a local and compact idea of progress, whereas the development of the spirit was almost impossible when the control was centralized for this factory in common with a number of other factories.

This again is a human matter and arises out of the same necessity—the necessity for a group spirit in a small group and the difficulty of securing a group spirit through the centralized operations of control in connection with a large group.

This is particularly true in the supervision work upon which depends the development of the subordinates and the increased efficiency of those subordinates. How much may be done in this direction is illustrated by the case of one factory which had failed to make money in the good years of 1918, 1919 and 1920, but which, under different management, with the same equipment, the same products, a much poorer market and a large and high-priced inventory, succeeded in returning a very decent dividend to its stockholders in 1921.

The whole details of this case are the painstaking details of the development of a group spirit, a thorough understanding, a pride, loyalty and consideration which found its expression in the increased efficiency and the increased profits. It is something of a feat to take an organization that lost money in 1920, and enable it to make money under those conditions in 1921. The character of the work becomes more impressive when the details of the job are understood. No elaborate systems were installed, no great changes were made in the organization, the man at the head of affairs simply tackled each problem as it came up, with the knowledge that he needed the

initiative, the ideas, the support and the good feeling of his subordinate officials, supervisors and workers, and the results were beyond his expectation and certainly far beyond anything expected or even contemplated by the financial powers in control of the situation.

The most difficult element in the organization of any industrial group is the proper distribution of authority and the proper development of understanding so that the judgment of the individual supervisors is required to exercise itself and co-operation in progress is secured by the loyalty engendered through the understanding.

It is comparatively easy to lay out a plan and require all members of the organization to adhere to that plan; secure its development on a centralized basis, and get a fair degree of production. It takes less time to do it this way. The officials who operate this way are on safer ground because they can refer to methods that have been used in the past and that are being used in other establishments, to prove the wisdom of their own actions. It is the safer way, but it is capable of less advancement and is responsible for a large amount of the waste present in almost all of the industrial concerns of to-day. No man can logically apply the term "leader" to himself or to any official who depends upon this centralized system of organization to turn out the work.

It is the business of the supervisor to develop the subordinates, to see that they have opportunities for exercising their judgment and their thought upon the work in proportion to their skill, and to develop a sufficient degree of understanding to maintain their loyalty. This cannot be done successfully where the organization reaches a great size under the usual methods of organization. It is not possible to put to work thousands of supervisors and secure any decent percentage of those supervisors who are capable of leading in this way.

It is not possible to secure executives in the numbers necessary and find them capable of organizing by the distribution of functional responsibility. Consequently, the larger the organization the greater the tendency toward highly centralized systems and all the difficulties which come from that condition. Hobson, in his book, "Evolution of Modern Capitalism," points out that the more efficient concerns tend to grow more rapidly than the general growth of the business and less efficient concerns grow more slowly. Institutions became of great size because of the rapid development of this country. The efficiency and leadership in the small group encouraged this rapidity of growth into a large group.

These factors of growth, however, do not justify the present size of such organizations, and in many lines of

business, they are not to-day growing as rapidly as the smaller organization in the same field. These smaller organizations, in many cases, are more efficient than the larger, and in the course of their growth they will tend to overtake these huge concerns and displace them from their dominating positions.

The increased efficiency will come more and more from an understanding of group organization in itself, and not from the character of the mechanical equipment, control of the raw supply, or the physical advantages merely. The difficulties of the large organization are increased and they must be met by the growth of leaders more profoundly informed upon the structure of business, the relation of this machine or industrial development in its different parts, one to the other, the things which govern human action and make for an increase of human efficiency. Economic conditions in an individual concern are the result of the human organization conditions, and they will be changed in accordance with the changes in this way.

An institution containing 25,000 men in various factories is as complicated in its governmental requirements as a city with its outlying communities, inside organization, differences of opinion, politics, individual grievances and all the other troubles inherent in community life which exist and, in many cases, flourish. The government of such an institution so that it can maintain itself against the competition of smaller and more flexible establishments requires a very broad knowledge, a very fundamental understanding, and a patient, painstaking movement, step by step, toward a more ideal condition.

The past success of the big organization does not indicate its future position. Success continues for some time after the methods that contributed to the success have been replaced or lost their usefulness. The continued success depends upon the agreement between the methods and the necessities, and this agreement has not yet been secured in the conduct of large organizations of business from the human standpoint.

Proposed Bearing Standardization

Metric Roller Bearings

AT a recent meeting of the Ball and Roller Bearings Division of the Standards Committee of the Society of Automotive Engineers, it was voted to request the Subdivision on Roller Bearings to continue consideration of the following revisions of the present S. A. E. Standards for Roller Bearings, proposed by the Subdivision on Nov. 20, 1918, as it was felt by those present that the demand for standard metric roller bearing sizes that are interchangeable with the wide or double row type ball bearings is becoming greater. It was stated at the meeting that the present dimensions of the standard metric roller bearings are generally considered very satisfactory, although possibly a few changes in tolerances, overall widths and corner radii should be made. All members present were of the opinion that these standards should be put into the best form possible.

Bearing Numbers—Bearings of the light series shall be designated by prefixing the letter L, the numbers ranging from L04 to L22 consecutively, and bearings of the medium series by prefixing the letter M, the numbers ranging from M04 to M22 consecutively.

Inside and Outside Diameters—The inside and outside diameters shall be given in integral millimeters and shall correspond to the inside and outside diameters for the same sizes of the annular ball bearing of the light and medium series, pages C26 and C28, S. A. E. Handbook.

Widths—The widths shall be given in inches and shall be in accord with the widths of the annular ball bearings of the wide type, page C31, S. A. E. Handbook.

New Sizes—The medium series shall be extended to specify dimensions for bearings Nos. M21 and M22; the inside diameter for bearing No. M21 to be 105 mm., the outside diameter 225 mm., and the width 3 7/16 in.; and the inside diameter for bearing No. M22 to be 110 mm., the outside diameter 240 mm. and the width 3 5/8 in.

Chamfers—The chamfer or radius on the inner and outer races of bearings of the light and medium series with inside diameters from 20 to 25 mm. shall be 1 to 1 1/2 mm.; for inside diameters from 30 to 50 mm., the chamfer shall be from 2 to 4 mm.; and for inside diameters from 55 to 110 mm., the chamfers shall be from 3 to 5 mm. The headings of the columns in the tables giving the chamfers shall read "Radius or Chamfer C"

and the limits shall be shown as maximum and minimum.

Clearances—The maximum clearances required for the bearing cage, when used, shall be given for each size of bearing. These clearances shall not be considered as standard, but as general information only.

Eccentricity Tolerances—Further consideration shall be given to the question of whether the eccentricity tolerances given in the present S. A. E. Standards refer to the error in running true actually measured or to the true eccentricity of the center of the inner and outer races.

Diameter Tolerances—Further consideration shall be given to the tolerances for the diameter, as these depend upon the type of bearing and its application.

Inch-Type Thrust Ball Bearings

Criticisms and suggestions in connection with the present thrust bearing standards that had been submitted to the Society were discussed. It was the consensus of opinion that the present standard should remain as published in the S. A. E. Handbook, it being stated by several members that they are in satisfactory form and use.

Advances in Acetylene Welding

RECENT advances in acetylene welding and some of the problems confronting the welding industry are considered in a report of the Oxy-Acetylene Welding Committee of the International Acetylene Association. It is stated that metals of almost any desired composition can be deposited by the oxy-acetylene torch, but that many important problems like preheating, heat treatment and annealing require consideration. Duriron, a high silicon cast iron, is being successfully welded, but must be most carefully preheated. Manganese steel is difficult to work, but good results are being obtained on simple castings. All of the regular alloy steels, such as nickel chromium and vanadium, can be welded without difficulty, but inasmuch as the welds are usually wanted where great strength is required, the process does not hold out much promise, unless the metal can be poured and heat-treated. Monel metal, which is being used for valves and similar purposes, has been welded successfully, and further studies are being made in this direction.

AUTOMOTIVE INDUSTRIES

THE AUTOMOBILE

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Developing Future Markets

THE production capacity of American automobile manufacturers is in excess of the immediate demand for cars in this country. As a result of this situation, brought about by the war and its aftermath of business depression, many factories are producing only a small percentage of what they could produce if there was an available market for their goods. Such a condition, naturally, is one to be overcome as rapidly as possible, and by the surest and most economical means possible. To overcome this situation means that the American manufacturer must find and develop new markets.

It is not a new thought that a study of the needs of foreign countries and preparation to supply those needs is, perhaps, the best way out of the difficulty. The conditions affecting international business have, in the recent past, been most unfavorable. In many instances they are not much better at present. The last few months of the past year, however, did much toward restoring the world's economic stability and the year 1922 will do more. Foreign exchange values

are becoming stabilized in certain instances, and the purchasing power of many countries will increase. There is a need for automobiles in many parts of the world and the United States is looked to to supply that need. It is no less true that American manufacturers need the rest of the world as a market.

While the year 1922 may not be a "big year" from the exporter's standpoint, it offers a chance to pave the way for future business. The manufacturer who has representatives in the various foreign fields talking the merits of his product in times of business depression will be the one to secure orders when that depression is over. If the desire is created before those countries have the money to buy, they will buy as soon as they get the money.

Power Gear Shifting

THE shifting of the gears is admittedly the most unpleasant operation in running a car. Few people learn to shift the gears deftly, so as to make a speed change without a grating noise under all conditions. The clashing of gear teeth, if often repeated, shortens the life of the gears.

Attempts have not been wanting to make the shifting of the gears automatic, with a view to lessening the physical exertion required of the driver and to remove the cause for disinclination on the part of some drivers to change gears. At one time the magnetic system of gear shifting had a certain vogue, being fitted particularly to high-priced cars. Gradually, however, the car makers who once supplied this system as standard equipment have either given it up or decided to supply it only as an extra. Such a gear shifting mechanism naturally involves considerable expense, and when competition in any particular class of cars becomes keen the manufacturers are always inclined to omit equipment and thus move into a lower price class if possible. Besides, the magnetic gear shift draws a very heavy current from the battery and, when much used, undoubtedly adds considerably to the wear and tear on the battery.

Most inventors have sought the solution of the problem in the provision of some mechanical device whereby the depression of the clutch pedal stores up the necessary amount of energy for shifting the gears. In this case, of course, the energy used for shifting is muscular energy, and the expenditure of physical energy in driving is not really lessened, but the driver does not shift the gears directly and does not feel the grating of the teeth against each other, at least not so distinctly. The operation of gear changing is somewhat simplified in that the approaching need for a change in the gear can usually be discerned some time in advance and the selector set for the speed which is to be engaged next; then when the change must be made, only a single operative movement—depression of the clutch pedal—needs to be made, instead of two separate and properly timed movements, as in an ordinary car.

Clashing of gear teeth is usually due to a great difference in pitch line velocity of the two gears at the time of meshing, and the art of changing gears quietly consists in first bringing the two gears to be

meshed to the same pitch line velocity. This applies as well to cases where mechanical power is used for shifting the gears as where they are shifted by the direct application of muscular power. Of course, it is possible that with an automatic shift, where the operator needs to merely depress the clutch pedal, his mind is not so much occupied, and he is more likely to bring the two gears to corresponding pitch line velocities by appropriate use of the throttle.

Whether the mechanical gear shift will prove more successful than the magnetic remains to be seen. One of the objections to the latter, that it throws additional load on the storage battery and shortens the life of same, is eliminated. In its simplest form it can undoubtedly be made considerably cheaper than the magnetic, which is another thing in its favor. On the other hand, there is much less novelty in automatic gear shifts now than there was when the magnetic made its appearance.

Concerning Design Changes

HERE are some who think that the next ten years of motor car development will see fewer and less extensive change in design than have been seen during the past decade; in short, that there will be an increasing tendency toward a more staple product. Most manufacturers are loath to make changes, as, indeed, they should be if the matter is viewed chiefly from the standpoint of economy in manufacture. But sooner or later the manufacturer who fails to keep his product abreast of the times finds that he is suffering in competition with more progressive organizations.

Engineers who are given to making forecasts regarding the future or ultimate type of car usually indicate, if they predict that variation from present type will be slight, that changes in respect to available fuel supplies may completely upset calculations and make necessary some far-reaching changes in design, at least so far as the engine is concerned. This is simply another way of saying that engineers who are wise are keeping a weather eye on the fuel situation—as there is good reason that they should. Those who have read the survey of the fuel situation contained in last week's AUTOMOTIVE INDUSTRIES and have followed other developments in this field will readily agree to this.

Fuel has, indeed, played an important part in respect to all automotive design and is destined to play a still more important part in the near future. This does not necessarily mean that radical changes in design are at hand, but it does mean that no time should be lost in efforts to meet the coming fuel situation, either with or without "radical" changes, as may prove most expedient. If, as seems quite possible, motor fuel becomes almost as expensive here as it is in England, for example (the difference is less to-day, quality considered, than many think), there may be some tendency toward smaller engines and lighter cars, as there has been in England, but this appears to us quite unlikely. What seems far more probable is a fairly close adherence to present size and general type, but certain changes in the functioning of engines, and in detail of design which will

enable our present general type and size of car to travel as far or farther per gallon of fuel than even the small British car of to-day. In fact, we seem to be just around the corner from developments which will leave us with cars as efficient in respect to fuel utilization as any now in common use anywhere, but just as powerful and flexible as the average American-built car of to-day.

While this is not a commercial reality, it is by no means an idle speculation. The thing has been done in an experimental way, and by several different methods. Some of these involve little or no more complication than we find in many cars which handle present fuels comparatively well, measured by present standards. In the past fuel prices have been such as not to encourage developments of this kind, but this condition is now passing. Furthermore, the modern car user is becoming more and more interested in anything which decreases operating costs.

So we must not and cannot remain contented with cars as they are. They must be made more dependable, more efficient and generally less expensive.

Discussing Bus Design

AUTOMOTIVE engineers will have an excellent opportunity to discuss the problems of motor bus design and the economics of bus transportation next week at the motor truck transportation session of the S. A. E. winter meeting. Truck transportation in general is included in the topic, but the discussion of buses should bring forth specially interesting material, since this will be the most important open forum that has been held on this subject to date.

It is to be hoped that considerable emphasis will be placed upon that phase of the subject dealing with the adaptation of ordinary truck chassis to bus work. It is strongly felt in many quarters that the regular truck chassis is not at all suitable for bus use and that radical changes in design are necessary if satisfactory operation is to be attained. The motor truck industry as a whole does not seem to have taken the interest in studying this problem of bus design that the possibilities of the field appear to warrant.

In a few instances definite progress has been made in modifying standard truck chassis so that they are more suitable for bus work, but there is really only one case in which the problem has been approached from the standpoint of pure bus design—and that case is not strictly within the motor truck industry.

A general survey of transportation possibilities in this country leads very definitely to the conclusion that there is a real need for the motor bus and that its ultimate development will be great. Every truck chassis used for bus work, however, which fails to fulfil its function properly and adequately acts as a deterrent to that development.

The task of suitable bus design properly rests with the engineers of the motor truck industry and the development of the motor bus with the motor truck firms. There is a future market which is worth cultivating. It is to be hoped that next week's S. A. E. meeting will bring forth some sound and pertinent discussion of this interesting matter of bus design.

General Revision of Prices Expected

New Models Also to Feature New York Show—Greater Value, Aim

By James Dalton

NEW YORK, Jan. 5—Several of the price cuts predicted for the turn of the year already have been made but more will follow, coincident with the opening of the New York show Saturday. Some of these reductions have been discounted but others will be more or less unexpected. It now seems probable that the revision will be more general than had been anticipated and that companies which had intended to stand pat will be forced into line to meet competition. As a consequence predictions are unsafe. New prices are a closely guarded secret until executives think the psychological moment has arrived to spring them.

New prices will be one of the sensations of the show. Another will be new models or old lines revamped to give purchasers improvements or comforts they have not had hitherto. The two combined will present motor car values not duplicated since the war and in some cases never equalled. Because of changes and improvements in equipment it is practically impossible to compare present values with those of pre-war days in individual makes.

More Business Forecast

Confidence of manufacturers that the new values will result in orders is evidenced by the fact that most of them have been assembling parts for complete units since current sales began to decline a month ago. This has been reflected in the unexpectedly large volume of business given parts and accessory makers in December. It is expected their sales for the last month of the year will exceed those for November.

A remarkable evidence of the stability of the industry in the past year is found in the fact that sales by members of the Motor and Accessory Manufacturers' Association for the last ten months have been in virtually the same volume each month. Sales in March jumped to \$20,000,000 from half that amount in February. They rose to \$26,000,000 in April and May. They fell to \$22,000,000 in June, while in July, August and September they were \$23,000,000. In October they dropped to \$22,000,000 and in November to \$19,000,000. They probably reached the \$20,000,000 mark again in December.

With December estimated, this would make a total for the year of approximately \$243,000,000. When the year began, however, all the vehicle manufacturers were loaded up with enormous inventories, so that only a part of their requirements for the year came from releases or new orders.

While the lower prices and the higher values which will be offered at the New York show will usher in an era of keener competition, it is generally believed prices will have been stabilized for a considerable period. This would hearten the dealers who would be able for the first time in a year to give prospective purchasers the whole-hearted assurance that no further cuts were in prospect.

The final estimate of production of passenger cars and trucks by American manufacturers in 1921 has been reduced from 1,700,000 to 1,680,000.

Small Property Sold to Bank for \$175,000

INDIANAPOLIS, Jan. 3—The William Small Co., maker of the Monroe, which has been in the hands of a receiver since August, 1920, was sold in a receiver's sale to the Fletcher American National Bank, a local creditor, for \$175,000 cash. It is understood that a reorganization of the company will be consummated soon, and that pending such action production will be continued.

According to James W. Fesler, receiver, there are approximately 450 creditors representing \$900,000 of undisputed claims and \$200,000 of disputed claims. He states that it will be impossible at this time to estimate on what percentage on the dollar the sale will permit the company to pay its obligations for the reason that certain expenses must be deducted from the purchase price before the creditors' accounts can be satisfied.

Service Truck Company Adds Rail Car Division

WABASH, IND., Jan. 3—A railroad car division, with a complete staff of its own, has been announced by the Service Motor Truck Co., following a demand created by demonstrations to railroad companies of the 30-passenger railroad coach mounted on a Service truck chassis. Charles Guernsey, for several years chief engineer of the company, has been made manager of the division; William Petty succeeds him as engineer, while William E. Marvel will be manager of sales of the railroad division.

Fifty railroad officials are expected here late in January to witness a test and demonstration of a new 55-passenger railway coach mounted on a Service truck. The new design is now under way and will be completed by the time of their visit.

Cooperation Halted by Court Decision

Some Associations Hesitate to Submit Statistical Data to Secretary Hoover

WASHINGTON, Jan. 3—The majority opinion of the Supreme Court in the hardwood case has had the expected result of disturbing co-operation between trade associations and the Department of Commerce. One association has given notice that it will not submit further statistical data to the Department of Commerce for use in the *Monthly Survey of Current Business*, issued under the direction of the Bureau of the Census.

Other associations have indicated that they are uncertain as to whether they will co-operate further, being apprehensive of the effect of the decision of the Supreme Court. The chief difficulty disturbing this co-operation, which has been carefully urged and built up on the initiative of Secretary of Commerce Hoover, has been the doubt left as to the actual effect of the decision.

Few Associations Affected

It is evident that careful analysis of the opinion has left the general impression that it affects the activities of only a small portion of trade associations of the country, but many associations which feel that they are not affected are at the same time left in doubt pending the clear interpretation of the decision by the Government.

For this reason, it is believed some of them at least will hesitate to co-operate with the Department of Commerce until Attorney General Daugherty presents an official statement expressing his views in the matter. Even this, however, will not satisfy representatives of certain associations who think that the only remedy assuring their legality lies in the enactment of legislation, though passage of such legislation, if undertaken, probably would require a long time.

Hoover Reiterates Views

Secretary Hoover has reiterated his view that the decision will have a bearing on only a small number of trade associations, estimating that it will not involve over 10 per cent of the total. This calculation is based on the survey made some time ago by the Department of Commerce as to the activities of the 1700 or 1800 trade associations of the country.

Nathan B. Williams, associate counsel of the National Association of Manufacturers, takes the same view that Mr. Hoover expressed and thinks that trade associations should continue their legitimate statistical activities and supply data to the Department of Commerce for public use.

Daugherty said he would confer in a day or two with Secretary Hoover on

(Continued on next page)

Paige-Detroit Cut; No Jewett Statement

Reductions Made Possible by Condition of Company, President Says

DETROIT, Jan. 3—Price reductions announced by the Paige-Detroit Motor Car Co. on all its models range from \$170 to \$680. The prices on the 6-44 line are:

	Old Price	New Price
2 passenger Touring..	\$1,635	\$1,465
5 passenger Touring..	1,635	1,465
Coupe	2,450	1,995
Sedan	2,570	2,245

The prices on the 6-66 models are:

	Old Price	New Price
4 passenger Touring..	\$2,975	\$2,245
3 passenger Touring..	3,295	2,495
7 passenger Touring..	2,875	2,195
Coupe	3,755	3,100
Sedan	3,830	3,155

President Harry M. Jewett stated the reductions were made possible by the financial strength and manufacturing facilities of the company which permit a large production schedule for 1922. The prices of the new Jewett car, the light six line which will be produced as a companion to the Paige, will not be announced until a meeting of Paige dealers at the New York show.

Apperson Adds New Body Models and Changes Prices

KOKOMO, IND., Jan. 3—Sharp reductions in prices will be announced at the New York show by the Apperson Bros. Automobile Co. The prices are:

	Old Price	New Price
4 passenger Sportster (open)	\$3,000	\$2,620
4 passenger Tourister	2,248	2,395
7 passenger Touring..	3,250	2,645
4 passenger Tourister (open)	3,500	2,995
4 passenger Sedanette	4,500	3,895
Sedan	4,500	3,995
Limousine (sedan)....	4,700	4,195

The Apperson line will be unchanged mechanically but two new body models will be added. They will be known as the "tourequip," listed at \$2,995, and a four passenger "tourister," with special equipment, listed at \$3,245.

STUTZ MAKES REVISION

INDIANAPOLIS, Jan. 3—Lower prices on its models will be announced at the New York show by the Stutz Motor Car Co. The prices will be:

	Old Price	New Price
4 passenger Touring..	\$3,350	\$2,990
6 passenger Touring..	3,350	2,990
Roadster	3,250	2,950
Coupe	4,800	3,990

NASH SIX CYLINDER DROPS

KENOSHA, WIS., Jan. 3—Price reductions ranging from \$155 to \$305 are announced by the Nash Motors Co. on all models in its new six cylinder line.

No price changes are made on the four cylinder line. The prices are

	Old Price	New Price
5 passenger Touring..	\$1,545	\$1,390
7 passenger Touring..	1,695	1,540
7 passenger Sedan....	2,695	2,390
Coupe	2,395	2,090
Roadster	1,525	1,360
4 passenger Sport....	1,695	1,545

The price on the new four cylinder taxicab has been reduced to \$1,395.

HAYNES LOWERS PRICES

KOKOMO, IND., Jan. 3—Price reductions on several of its models will be announced at the New York show by the Haynes Automobile Co. The prices follow:

Model 55	Old Price	New Price
5 passenger Touring..	\$1,785	\$1,595
Roadster	1,835	1,645
Coupe (new line)....		2,295
Sedan	2,835	2,595

Model 75	Old Price	New Price
7 passenger Touring..	2,485	2,395
4 passenger Tourister	2,485	2,395
Speedster	2,685	2,595
Brougham		3,095
Sedan	3,485	3,395
Suburban		3,395

Additional Reductions on Page 43

Cooperation Halted by Court Decision

(Continued from preceding page) the question of publication by the Commerce Department of trade statistics gathered by the various associations. The attorney general declared that procuring information was not in violation of the law, the only question being whether the associations use the trade information when collected for illegal purposes, such as fixing prices, dividing territory or limiting production.

Distribution of Goodspeed Limited to Eight Centers

CHICAGO, Jan. 3—Distribution of the new Goodspeed car, which will be shown by the Commonwealth Motors Co. for the first time at the New York and Chicago shows, will be strictly limited.

A statement by Leland F. Goodspeed, vice-president and chief engineer, says that there will be distribution only in eight Metropolitan centers and that production will be so limited that only a few of the cars will be available in each of these cities. Goodspeed spent nine years perfecting his new motor.

M.A.M.A. COMMITTEE TO ORGANIZE

NEW YORK, Jan. 3—The foreign trade committee of the Motor & Accessory Manufacturers Association, headed by W. O. Rutherford, vice-president of the B. F. Goodrich Co., will be organized some time during show week in New York. The additional members of the committee will be announced at that time.

Ford Changes Parts Distributing Policy

Dealers May Solicit Wholesale Business at 33 1/3 Per Cent Discount

DETROIT, Jan. 3—Genuine Ford parts will be available for sale in all stores conducting a general accessory or parts business under a change in the service plan of the Ford Motor Co. which will permit its authorized dealers to solicit wholesale business from stores of this character at discounts of 33 1/3 per cent f.o.b. Hitherto the selling plan by dealers permitted only a 25 per cent discount to garages and accessory stores on sales in any quantity that the dealer could supply.

Under the new policy the dealers may solicit the wholesale business in certified quantity lots, these to be shipped from the branch plant in the territory. Through this plan all stores engaging in the supplying of automobile parts, and this includes stores maintaining automobile accessory departments, will be able to handle genuine parts for the first time on a basis competitive with parts supplied by outside manufacturers.

Big Stocks Unnecessary

Stores and garages unable to buy in the quantities certified for the bigger discount will continue to be sold at the former 25 per cent rate. The Ford dealer may go after the new business without the necessity of carrying a heavy stock of parts on hand, though a sufficient stock will be carried in the dealer stations to supply, as formerly, the garage and small accessory trade. Stocks in the branch plants will be augmented to meet the increased demand.

Through the sale of genuine parts more generally, the factory is undertaking to obtain much of the business which has been going to outside manufacturers, and feels that owners will derive added satisfaction and additional service from their vehicles.

HEARS TEMPLAR MOTION

COLUMBUS, Jan. 3—Judge Charles Warner in the Franklin County Court heard the application of N. P. Clyburn of Washington Court House for a receiver for the Templar Motors Co., a Delaware corporation, and also the Templar Motor Co., an Ohio corporation. The action is resisted on the technical grounds that the corporation was not legally served to appear in Franklin County.

LABOR SEEKS ROAD WORK

NEW YORK, Jan. 3—The executive council of the New York State Federation of Labor has addressed a letter to Governor Miller, urging him to use his influence to have highway building undertaken by the state as a means of alleviating unemployment.

Owen Tire Receiver Sues Former Officers

Seeks Recovery of Commissions and Title to Property in Bedford

CLEVELAND, Jan. 3—W. M. Scott, receiver for the Owen Tire and Rubber Co., organized in 1917, and owner of a large plant for the making of tires and tubes at Bedford, a suburb of this city, has made charges of fraudulent actions and misconduct against former officers of the corporation, in a series of suits filed in common pleas court here.

In one action, Scott sues for the recovery of \$160,803.56, which he says was paid illegally as commissions on sales of stock of the Owen company. In his petition he states that the Rubber Securities Co. was organized to sell stock of the tire company, and that W. C. Owen, former president and general manager of the tire company, owned 8 shares of stock in the securities company; W. J. Owen, an Owen director, 2 shares, and E. M. Blatz, director and vice-president of the Owen company, 2 shares.

High Commission Alleged

Scott charges that at a meeting of directors of the tire company, at which were present, W. C. Owen, W. J. Owen, E. M. Blatz and Charles I. Reese, it was voted on behalf of the tire company to give the securities company a contract for selling stock of the tire company and to pay 15 per cent commission on all stock sold. Scott charges the resolution was illegally adopted and was for the purpose of enabling the officers of the tire company mentioned to obtain illegal commissions on sales of stock.

He further alleges that the securities company maintained no offices of its own, but conducted its activities in quarters provided in the plant of the tire company. W. D. Areese and O. M. Dickison of the securities company, also are defendants in this suit.

Architect's Fees Involved

In another action, Scott charges that W. C. Owen, who became general manager and president of the tire company, on Sept. 2, 1918, secured from its directors a contract in the name of the W. C. Owen Co., for services as an architect in drawing plans for a rubber manufacturing plant in Bedford and for supervising its construction. Under this contract Owen was to receive an architect's fee of 16 per cent of the total cost of the building. On this contract, which, it is charged, was entered into at the time Owen was a director and stockholder of the tire company, it is alleged \$80,538.28 has been paid to Owen. The petitioner asks for the recovery of this sum.

In another suit Scott asks the court to turn back title to six lots in Bedford, which it is alleged, were purchased with tire company funds and to which, it is

CONNECTICUT CLASSES HEARSE AS TRUCKS

BRIDGEPORT, CONN., Jan. 3—Motor hearses used in Connecticut are, under the revised State motor vehicle statutes, classified as trucks and, being available for hire, must be registered as public service motor vehicles. Because of the former classification, they must bear plates indicating their rated capacity.

Funeral directors of the State express indignation over interpretations of the statute in question and have appealed. Motor Vehicle Commissioner Robbins B. Stoeckel, following a conference with Attorney General Frank E. Healy, has notified the Connecticut Undertakers Association that he is powerless to change this classification and suggests that an amendment be proposed at the next legislative session, if a change is desired.

charged, Owen took title in his own name, and for the recovery of title to other property which he says should rest in the Owen company.

Owen has not made a statement and his answers are not on file.

Agricultural Engineers Come to Aid of Society

CHICAGO, Jan. 3—At the business session of the fifteenth annual meeting of the American Society of Agricultural Engineers held in this city it was reported to the members that the society is somewhat in debt and that either financial relief must be found at once or some of its activities eliminated. Two direct economy proposals were offered: First, the suspension of the journal of the society; second, withdrawal from the Federated Engineering Society of America.

Immediately, members from the floor objected to the elimination of any of the present activities from the society and expressed the opinion that both the Journal and the membership in the Federated Societies were necessary to bring agricultural engineering into the position it deserved. The members supported this position by voluntarily offering to pay the higher dues to be levied this month and several of the members present offered additional financial assistance.

N. A. C. C. TO HEAR MACDONALD

NEW YORK, Jan. 3—Thomas H. Mac Donald, chief of the Federal Bureau of Public Roads, will address the National Automobile Chamber of Commerce export managers' convention next Tuesday on "How the United States Government and Automotive Exporters Can Stimulate Good Road Movements Abroad." Another speaker not previously announced will be Charles S. Wall, executive secretary of the National City Co.

1,535,000 Automobiles Produced in 1921

Truck Output Aggregated 145,000 —Total Production 24 Per Cent Below 1920

NEW YORK, Jan. 3—Careful estimates made by the statistical department of the National Automobile Chamber of Commerce show that the production of cars and trucks in the United States in 1920 was 1,680,000, a decrease of 24 per cent from the 1920 production. The passenger cars built numbered approximately 1,535,000 and the trucks 145,000.

The wholesale value of cars and trucks produced is estimated at \$1,222,350,000, a decrease of 45 per cent from the 1920 wholesale value. The average wholesale price of the motor cars sold in 1921 was \$702 as compared with \$897 in 1920 and \$968 in 1919.

The National Automobile Chamber of Commerce estimates that there are registered in the United States approximately 10,000,000 motor vehicles, of which 1,000,000 are trucks. Farmers own 2,850,000 motor cars and 150,000 trucks. It is estimated that farm products hauled by motor transport for the year totaled 134,400,000 tons.

There are now in operation about 20,000 motor buses and 1500 public motor express lines. It is figured that 6,000,000,000 passengers are carried annually by motor car and 1,200,000,000 tons of freight by motor truck. The number of street railway lines now using motor buses is 35 and the number of steam railroads using motor trucks with flange wheels is 12.

Gasoline production in the United States in 1921 was 5,360,014,000, an increase of 9.8 per cent over 1920. Gasoline consumption increased 5.9 per cent.

Tire casings produced last year numbered 19,379,000 and inner tubes 24,157,000.

The value of motor vehicles and parts exported in 1921, including engines and tires, was \$102,945,610. Motor cars exported numbered 30,639.

FORD 100,000 AHEAD OF 1920

DETROIT, Jan. 3—The Ford Motor Co. states that its sales for 1921 will run about 100,000 ahead of 1920. This figure was reached by Dec. 1 and the total for the year is not expected to show much deviation. Production in 1920 was 1,023,553. There will be no heavy inventory of complete cars carried over the winter as was the case last year.

FEDERAL ROAD AID FOR KANSAS

LAWRENCE, KAN., Jan. 3—Announcement was made to-day by the State Highway Commission of the receipt of the Federal road appropriation of \$2,102,281 for Kansas roads. Of this fund \$700,000 is immediately available.

Arbiters Classify Fekete Invention

Not Entitled to Place in "Class B" in Cross Licensing Agreement

NEW YORK, Jan. 3—An arbitration board appointed to consider the Hudson crankshaft case has decided that the invention of Stephen I. Fekete, chief engineer of the Hudson Motor Car Co., is not entitled to classification as a "Class B" invention under the patent cross licensing agreement existing among the members of the National Automobile Chamber of Commerce.

Some years ago Fekete obtained a patent on a crankshaft design for a six-cylinder engine and assigned that patent to the Hudson company. Since then this design has been embodied in the engines with which the Hudson Super-Six is fitted. The Hudson Motor Car Co. being a member of the N. A. C. C., there arose the problem of properly classifying the invention.

Three Classes Recognized

In the cross-licensing agreement three different classes of inventions are recognized, namely, Class A or basic inventions; Class B, inventions of a striking character, involving a radical change from existing practice, and Class C, inventions which include all mere improvements, variations or modifications.

It was the contention of the Hudson company that the Fekete invention came under classification B, but this was denied by the experts of the N. A. C. C. A demonstration to prove the effect of the Fekete method of counterbalancing a six-cylinder crankshaft was made as long ago as 1917, when horsepower tests of a Hudson Super-Six engine both with and without the Fekete counterweights were made at the Hudson plant in Detroit, in the presence of a number of patent experts and technical press representatives.

Arbitration Necessary

No agreement was reached between the Hudson Motor Car Co. and the N. A. C. C. as the result of this demonstration, and the matter was finally put in the hands of an arbitration board consisting of Walter C. Noyes, Michael I. Pupin and Rolla E. Carpenter. Carpenter was later replaced by Charles E. Lucke.

The specific definition of Class B inventions in the agreement is an invention of a striking character involving a radical departure or radical change in from what is known; it must result from an inventive effort of a high order, and must not be a mere improvement, variation, modification or natural development of the existing art resulting from an ordinary effort of the inventive faculty.

The crankshaft covered by the Fekete invention, which is protected by a re-issue patent, No. 14,292, issued on April

SCHEDULE OF EVENTS FOR AUTOMOBILE SHOW WEEK IN NEW YORK

NEW YORK, Jan. 4—Following is a schedule of events for automobile show week.

MONDAY, JAN. 9.

Annual meeting Rubber Association of America, Waldorf-Astoria, 2:30 P. M.
Meeting of Traffic Committee, National Automobile Chamber of Commerce, 2:30 P. M.
Divisional meetings Rubber Association, Yale Club.
Opening Body Builders show, Twelfth Regiment Armory, Columbus Avenue and 62nd Street.
Opening automotive accessories show of National Retail Merchants and Buyers Association, Hotel Imperial.
Dinner of Rubber Association, Waldorf-Astoria, 7 P. M.
Dinner of Aero Club of America, Commodore, 7:30 P. M.
Dinner of Old Timers Association, Flotilla restaurant, Sixth Avenue and 56th Street, 7 P. M.
Meeting National Highway Traffic Association, Automobile Club of America, 8 P. M.

TUESDAY, JAN. 10.

Annual convention export managers National Automobile Chamber of Commerce at N. A. C. C. headquarters, 10 A. M.
Meeting of Truck Committee of N. A. C. C., 2:30 P. M.
Meeting of Patents Committee of N. A. C. C., 2:30 P. M.
Annual meeting, Society of Automotive Engineers, Engineering Building.
Dinner of N. A. C. C., Commodore, 7 P. M.

WEDNESDAY, JAN. 11.

Annual meeting of Motor and Accessory Manufacturers Association, Commodore, 2:30 P. M.
Monthly meeting directors of N. A. C. C. at 10:30 A. M.
Meeting of Executive Board of American Automobile Association, 501 Fifth Avenue, 10 A. M.
Luncheon of National Association of Show Managers at Woodstock hotel at noon.
Meeting of Legislative Committee of N. A. C. C., 3 P. M.
Dinner of M. A. M. A. at Commodore, 7 P. M.

THURSDAY, JAN. 12.

Annual dinner of S. A. E. at Hotel Astor, 7 P. M.
Paige-Detroit Motor Car Co. dinner at Commodore, 7:30 P. M., to unveil new Jewett car.

FRIDAY, JAN. 13.

Dinner and convention of Automobile Service Association at Automobile Dealers Club, 6:30 P. M.

Michigan Protects Truck Lines from Competition

DETROIT, Jan. 3—The Michigan Public Utilities Commission through its chairman, Sherman T. Handy, has outlined its policy toward controlling motor truck lines. The commission will endeavor to prevent dissipation of utility property by unfair and unnecessary competition. Bus routes are already under state control in Ohio.

"When the Legislature seeks the co-operation of this commission in drafting legislation for the regulation of motor truck transportation, we will recommend such legislation as will protect the pioneer, stable and serviceable interests then engaged in it from unfair and unnecessary competition to the end that a fair return may be received on the investment and a fair grade of service rendered to the public," Handy says, in speaking of the situation.

Handy believes manufacturers operating their own truck lines could not be designated as common carriers. Authorization of motor truck lines parallel to existing serviceable transportation routes is regarded as unlikely. "Loss to the public inevitably follows unreasonable and unnecessary utility competition," says Handy.

Willys Inventory Reduced \$27,000,000 in 6 Months

TOLEDO, Jan. 3—Branch managers of the Willys-Overland Co. have been informed by John N. Willys that the inventory of the corporation now is in the neighborhood of \$19,000,000 as compared with about \$46,000,000 six months ago.

"This inventory is not out of line with the requirements for our 1922 program and we look for the purchase of at least \$11,000,000 worth of materials before the end of March," Willys said.

Sheridan Features Few in New Durant

Six-Cylinder Successor Will Have Four Models—Has Ansted Engine

NEW YORK, Jan. 3—Production of a six-cylinder car has been undertaken by the Durant Motors Corp., which some time ago took over the business of the Sheridan, manufactured by the General Motors Corp. in Muncie, Ind. The name was changed to the Durant Six and the car was completely redesigned so that few of the features of the Sheridan remain.

Four models will be produced which will sell as follows: Roadster, \$1,600; touring car, \$1,650; coupé, \$2,250, and sedan, \$2,400.

Equipped with Ansted

The Durant Six is equipped with the Ansted overhead valve high speed engine with an N. A. C. C. rating of 25.4 hp. The engine, however, is said to develop 70 hp. at 3000 r.p.m. on the block. The carburetor is the Rayfield horizontal type and is fed by the Stewart vacuum system. Engine lubrication is by the pressure system, the pressure being automatically controlled in accordance with the load. Chassis lubrication is by the Alemite high pressure grease system.

Ignition is by the battery system, the combined interrupter and distributor being mounted on a vertical shaft at the left hand side directly back of the camshaft gear housing. Auto-Lite starting and lighting systems are employed. A storage battery of U. S. L. make is carried in an accessible position to the driver's seat.

The radiator is the cellular type, the water being circulated by a centrifugal pump mounted forward at the right hand side of the engine. Should this pump fail, the water can be circulated by gravity or thermo-siphon action.

Transmission Separate

An unusual feature of design lies in the fact that the transmission or gearset of the Durant Six is not built in a unit with the engine, but is mounted separately amidships. One advantage claimed for this form of construction is that the clutch can be more easily removed when necessary. The clutch is of the multiple disk type and is provided with means of adjustment. The transmission is of the sliding gear type affording three forward speeds and reverse. Provision is made in the design of the transmission housing for the mounting of a tire pump.

The rear axle is a Timken semi-floating type with third member, and the front is a Timken one section axle of nickel steel. The wheels are mounted on Timken roller bearings. There are both internal and external brakes on the rear wheels.

The frame consists of channel section

pressed steel members made from 5/32-in. carbon steel stock. The springs are semi-elliptic all around with the leaves polished and graphited. Wheels are of the wood artillery type and tire equipment consists of 32 by 4½ in. Fisk cord tires, nonskids at the rear.

The bodies are of the streamline reinforced type, upholstered over curled hair and long springs.

Fully equipped the car weighs 3350 lb. It can be turned around in a 42 ft. 8 in. radius.

Franklin Adds Coupe to Closed Car Line

SYRACUSE, Jan. 3—A coupé has been added to the Franklin line of closed cars, which previously consisted of a sedan and a brougham. The new coupé seats four passengers and has been brought out particularly to meet the needs of doctors and women drivers. A good sized parcel box is located to the left of the rear seat, and there is room for luggage in the boot, which is provided with a water-tight lid.

The windshield is of the straight front type, the lower section being fixed and the top section hinged, ventilation being effected through side cowl ventilators. An inside adjustable eye shade takes the place of the usual outside visor, the object being to avoid the need for getting out of the car for adjusting the visor. The left door locks from the inside, the right from the outside, with a Yale lock and key. The roof construction is slatted and padded, which has a tendency to deaden noise.

Two New Case Models To Appear This Season

RACINE, WIS., Jan. 3—Two new Case models are to make their appearance for the 1922 season, these being models X and W. Model X will be priced \$1,890 for the touring car and \$2,790 for the sedan. It has a wheelbase of 122 inches. Continental 7-R engine, bore 3½ in. and stroke 4½ in. A Rayfield thermostat controls the cooling water. The starting and lighting system is Bijur.

The other model, W, is to sell at \$2,380 for the touring car and \$3,375 for the sedan.

HAYNES PRODUCING COUPELET

KOKOMO, IND., Jan. 3—The new Haynes, model 55, three passenger coupelet is to be shown for the first time at the New York show. The three passengers ride side by side and there is no staggered seat. The chassis is the standard 55 model, mounted on a 121 in. wheelbase. The body is finished in coach blue and the car is fitted with 33 x 4 in. cord tires.

VELIE HAS OWN ENGINE

MOLINE, ILL., Jan. 3—The Velie Motors Corp. is now in production on the new model 58 which has a 115-in. wheelbase and is equipped with Velie built 6-cylinder engine with overhead valves.

Ryan Heads Company Producing Frontenac

Chevrolet Corporation Reorganized—No Connection With Stutz Motors

NEW YORK, Jan. 3—The new Frontenac car designed by Louis Chevrolet, which will be shown for the first time at the Hotel Commodore next week, will be built by a new company backed by Allan A. Ryan and a syndicate of capitalists. Beyond the fact that Ryan is the dominating figure in the Stutz Motor Car Co. there will be no connection between the two corporations, it is asserted.

Detailed plans for the new company have not yet been worked out but it will be a reorganization of the old Frontenac Motors Co. incorporated some time ago by Chevrolet. Negotiations have been completed for the purchase of a plant in Indianapolis large enough to permit quantity production of the new car, which is described elsewhere in this issue of AUTOMOTIVE INDUSTRIES.

It is understood that the president of the company will be a man widely known in the automotive industry but his identity has not been disclosed. Chevrolet personally will have a prominent place in the organization.

The Frontenac organization will be entirely distinct from that of Stutz but it is possible many of the Stutz dealers may take on a new line in addition to the old. It is planned to begin production in the near future.

The Frontenac car will sell for from \$2,000 to \$2,200.

Seiberling Cord Tire to Be Exhibited at Show

AKRON, Jan. 3—The new Seiberling cord automobile tire, invented by F. A. Seiberling, will be exhibited at the New York show. The tire is said to be a radical departure from cord tire practice and will be featured by a treadstock running from bead to bead and replacing the old fabric side wall.

Seiberling states this semi-flat tread construction with treadstock side walls will prevent rut wear on the tires and will prevent damage to tires on machines which stand with the tires pressed against a curb. The Seiberling cord will have no mileage guarantee but will sell for only a little above the standard list price.

The tire will be manufactured at the Portage plant at Barberton, recently purchased by Seiberling. Shipments will be started by March 1.

GRAY TO BE AT COMMODORE

DETROIT, Jan. 3—The Gray Motor Corp. will exhibit its new car in the lobby of the Hotel Commodore during the New York automobile show. The car, which has been produced by Frank L. Klingensmith and F. F. Beall, will sell for less than \$500.

Opposes Higher Duty on Oils and Asphalt

Senate Committee Told Industry Would Suffer—Tariff Action Urged

WASHINGTON, Jan. 3—Protesting the proposal to increase the duties on oils and asphalt because of its effect on automobile owners, M. O. Eldrege, of the American Automobile Association, told the Senate Finance Committee that higher tariffs would prove costly to American industry.

He estimated that a higher duty on Mexican oil would increase the price of gasoline from 3½ cents to 7 cents per gallon and tax automobile users about \$140,000,000 annually in addition to the present heavy internal revenue assessment. It was his contention that a tariff on oil would have a tendency to encourage monopolies in petroleum.

A partial view of the entanglements surrounding the tariff are sufficiently significant to show that its enactment will be delayed indefinitely. This is proving disappointing to manufacturing interests of the country and is assigned as one reason for the calling of the special convention to be held in Washington on Jan. 30-31 by the National Association of Manufacturers.

Immediate Tariff Needed

The association is of the opinion that immediate passage of a tariff of one form or another is more urgent to relieve the nation's manufacturers of their present anxiety and to bring about a stabilization of world business. The manufacturers express the belief that Congressional delay over the tariff is retarding business in many lines.

The Senate Finance Committee has undertaken to revise the House tariff bill after extended hearings. They are cognizant of the need for serious consideration of a marked departure in tariff making as proposed by the President in his annual message.

The first and greatest task of the committee will be to reach a decision as to the plan to be adopted, a question that is the source of heated discussion and much propaganda on the part of proponents and opponents of the American valuation plan. If the plan is not adopted in toto, the flexible system as suggested by the President is expected to be with sentiment favoring the latter, judging from indications.

ASKS INSURANCE RECEIVER

CHICAGO, Jan. 3—Insurance Commissioner Hands of Michigan has asked for the appointment of a receiver for the United States Mutual Automobile of Saginaw on the ground of insolvency. The Mutual has liabilities of \$105,000, largely in unpaid loss claims. A 50 per cent assessment was levied in October, but a large part of the membership refused to pay and the unpaid losses kept mounting.

It is also charged that the company wrote business at cut rates and paid extravagant salaries to its officers. These were also officers of the Peninsular Fire of Grand Rapids, which is having trouble with the Michigan department.

Springfield Body Works Planning for Expansion

SPRINGFIELD, MASS., Jan. 3—Production of automobile bodies has entered upon a period of expansion in this district. The Auto Metal Body Corp., building Hupmobile bodies, plans an early enlargement of its plant. The All-Metals Co. is negotiating for a building in which to engage in the systematic manufacture of bodies. Springfield Coach Works has bought the land and buildings on which its factory is located, and in the near future will erect a structure specially adapted to its needs. Smith-Springfield Body Corp. is being operated at its full capacity of 250 employees. This concern is getting an increased number of orders for bodies for foreign cars, a trade lately revived after being interrupted by the war.

New Campbell Foundry Will Double Production

DETROIT, Jan. 3—Campbell, Wyant & Cannon Foundry Co., Muskegon, will open its new plant unit soon after Jan. 1, doubling the production capacity of the present plant and bringing the number of employees to 3000 men. Facilities will be available for the production of 1,250,000 lb. of castings daily.

Arrangements are such that all material coming in raw at one end leave the other as finished castings. All material and product will be handled mechanically.

ALLEN FUTURE IN ABEYANCE

COLUMBUS, Jan. 3—The future of the Allen Motor Co., now in the hands of George A. Archer and William C. Willard as receivers, will be determined at a meeting of creditors to be held in the near future. The receivers have received an offer of \$570,000 for the assets of the company, not including cash, accounts receivable and notes receivable. This is the best offer so far received and it is probable that the court will be asked to accept it. If the offer is not accepted the property will be advertised and sold under a judicial order.

STEVENS-DURYEA ADDS BODIES

CHICOPEE FALLS, MASS., Jan. 3—Stevens-Duryea, Inc., is bringing out three new body models, a roadster, a 4-passenger sedan and a 6-passenger sedan. The 4-passenger sedan is semi-collapsible, the rear part being of leather, with a beam ceiling effect inside, and of owner's drive design. The 6-passenger sedan resembles the vestibule limousine, but is built on more compact lines. It is hoped to bring these cars to the production stage this month.

Oregon Places Bus as Public Utility

New Law Regulating Operations Has Support of Legitimate Lines

PORTLAND, Dec. 31—Operation of motor buses and trucks engaged as common carriers in Oregon is placed under the strict direction of the Oregon public service commission, according to a law passed at a special session of the legislature this week. While the law is aimed to protect the public roads and to guard the welfare of the traveling public, it has the support of the legitimate bus lines.

Under the new law the state public service commission will grant franchises for operation of bus lines under the rule of necessity and convenience to the public, holding the power to revoke these franchises in cases in which the bus operators maintain regular service and charge satisfactory rates. The law virtually places the bus lines under the same general restrictions as the railroads.

To Enforce Weight Law

The public service commission has the authority to regulate rates charged by the bus lines, to fix rules and regulations governing their operation and to exercise other general regulatory authority. Among the requirements that probably will be made by the commission will be the filing by the bus lines of tariffs showing their rates, and schedules and annual reports covering finances and data regarding operations. The law will prevent the operation of the fly-by-night bus operator, as bus operation which is other than permanent and continuous will not be allowed, except to care for special emergencies.

In regard to operation of trucks on the public roads the state legislature reached the conclusion that the present scale of weights and speeds as applied to trucks is ample, and that stricter enforcement of the law is necessary. To cover this phase a measure was passed forming a state motor police under the state highway department. This state police will in time replace county speed officers and city motor policemen in the small towns, it is aimed.

A third measure passed by the legislature provides for increasing the tax on retail sales of gasoline from two to three cents, in order to raise \$3,000,000 to aid in conducting a world's fair in Portland in 1925.

PACKARD MAY BUILD IN POLAND

BERLIN, Dec. 21 (By Mail)—It is reported here that the Packard Motor Car Co. of Detroit intends to erect an automobile factory in the town of Torun, Poland. It is stated a site has been purchased and preliminary work begun. The capital of the Polish company will be \$1,000,000.

Road Association Urges Higher Taxes

Also Requests Government to Distribute More Tractors for Highway Work

WASHINGTON, Jan. 3—Further distribution of surplus motor vehicles, especially 5 and 10-ton caterpillar tractors has been requested by the American Association of State Highway Officials, as a result of resolutions passed at their annual meeting at Omaha.

Assurances were given the President and Congress that materials and equipment received from the War Department have been of incalculable service to the States in the prosecution of their programs of highway construction and maintenance and that they have been used for these purposes and for no other, with a resultant saving of untold millions of dollars to the American people. This expression was made as a result of criticism from certain business interests that the materials thus made available for the public use have been generally mismanaged and illegally disposed of by the States.

Owner Willing to Pay

The association also went on record in favor of higher taxes on motor vehicles. It was resolved that the association "urge upon all States the fairness and the necessity of collecting an adequate portion of the cost of highway programs from the users of motor vehicles. This fair share is not only the cost of maintenance of modern highways, but includes also a fair proportion of the cost of new construction, because much of this latter cost is due to the necessity of adequately providing for motor traffic. It was recommended that appeals be made to the individual motorist for his support of a policy of providing for a fair distribution of the cost of highway improvement."

It was stated that in most of the States the owners of motor vehicles are paying an insufficient portion of the cost of the State's highway program, as compared to the portion of the cost raised by taxation on general property, despite the fact that the individual owner is always willing to pay his fair share of such cost.

Suspends Bonus Plan Pending Further Study

NEW YORK, Jan. 2—Pierre S. du Pont, president of General Motors Corp., has issued the following statement regarding the corporation's bonus plan:

In order to reduce the labor turnover and to induce employees of exceptional merit to remain with the corporation for a period of years, a bonus plan was adopted in 1918. The corporation each year proposed to deduct a certain percentage from its net earnings and this amount of money was to be placed in a bonus fund to be invested in stocks of the corporation.

At the end of each year employees of merit

were to be awarded stock of the corporation out of this bonus fund. The stock was to be held in trust for a period of five years when it was to be delivered to the employees free and clear. In the interim the employees were to receive the dividends.

The experience gained during the actual operation of the plan indicates that it is desirable to make certain changes. A committee has been appointed to make an exhaustive study thereof but because of the large number of employees affected and the many problems involved, it will not be possible to complete the study for several months.

The operation of the present bonus plan has, therefore, been suspended pending the completion of the study, which will likely result in an amended plan to be adopted during the current year. This amended plan will not affect awards heretofore made to employees under the provisions of the old plan and the rights of these employees will in no way be affected through the suspension thereof.

New World's Record Made for Non-Stop Air Flight

NEW YORK, Jan. 3—A new world's record for a continuous non-stop flight in a heavier than air machine was established at Roosevelt Field near Mineola when Edward Stinson and Lloyd Bertrand remained in the air 26 hours, 19 minutes and 35 seconds in a Larsen all metal monoplane. The flight was made in gales, snow and a zero temperature. The distance covered was at least 2200 miles. The previous record, made in France, was 24 hours, 19 minutes and two seconds. It was made on a clear day in June after a careful preparation.

J. L. Larsen, owner and designer of the monoplane, stated that it was made in America by American workmen and of American material.

British to Offer Prize for Helicopter Airplane

NEW YORK, Jan. 3—A dispatch from London says that the British Air Ministry proposes to offer a prize of £50,000 for a practical helicopter designed airplane capable of rising vertically and soaring over a given spot.

The machines must be capable of rising to a height of 2,000 feet under their own power, carrying one man and one hour's fuel supply; be able to remain stationary over a ground object for half an hour in any wind up to 20 miles an hour as well as land safely in any wind up to 20 miles an hour without horizontal motion and with the engine shut off.

TERNSTEDT HOLDS DINNER

DETROIT, Jan. 3—Ternstedt Mfg. Co. celebrated its third anniversary by tendering a dinner to its executives and department heads. As emblematic of the growth of the company in the four years of its existence it was pointed out that the number of men participating in the anniversary dinner has increased from fifteen in the first year to 115 this year.

President Paul W. Seiler ascribed the growth of the company to the co-operative spirit actuating the men in authority.

Common Dividend Passed by G. M. C.

Company in Strong Position Despite Losses Written Off, du Pont Says

NEW YORK, Jan. 4—The directors of the General Motors Corp. at their meeting here to-day omitted the dividend upon the common stock due to be declared at this time. The regular quarterly dividends upon the other classes of stock were declared as follows: Six per cent preferred, \$1.50 a share; 6 per cent debenture, \$1.50 a share; 7 per cent debenture, \$1.75. These dividends are all payable on Feb. 1 to stockholders of record at the close of business Jan. 14.

Pierre S. du Pont, president of the corporation, issued a statement following the meeting in which he said:

This action, taken after full discussion and most careful consideration, is believed to be in the best interests of the corporation and is designed not only to strengthen the position of the corporation itself but also to maintain the investment character of its debenture and preferred stocks.

Losses Accepted

The past year demonstrated satisfactorily the large earning capacity of many of the more important divisions of the corporation, the aggregate profits of which even under the adverse conditions that have obtained in the automobile industry, are estimated to have been in excess of the amount required for dividends on the debenture, preferred and common stocks.

On the other hand, substantial losses were made by other divisions due mainly to large inventories carried at high prices in the face of a constantly declining range of prices for the finished product and also to extensive commitments entered into in the earlier part of 1920 for parts and supplies at the high prices then prevailing. Moreover, in closing the books as of Dec. 31, 1921, further charges will be made against surplus to write down inventories to market prices and set up reserves to provide for losses properly chargeable to prior years.

Liabilities Reduced

The corporation is in a strong position financially. Inventories have been greatly reduced, and bills payable which amounted to about \$72,000,000 on Dec. 31, 1920, have been reduced to about \$49,000,000 as of Dec. 31, 1921, cash on hand in banks amounting to approximately \$41,000,000. Accounts payable and other quick liabilities have likewise been reduced, viz from about \$42,000,000 to \$30,000,000. After writing off all determinable losses and writing down inventories, the ratio of current assets to current liabilities as of Dec. 31, 1921 will be approximately two for one.

The corporation's plants have been maintained in a high state of efficiency. Substantial economies have been effected in many directions and others are in contemplation, and most satisfactory progress has been made in improving the character and raising the standard of the corporation's product to the end that it will be enabled effectively to meet competitive conditions and maintain its position in the trade.

Marmon Makes New Price Reduction

Total Revisions Effective During Year Range from \$1,300 to \$1,500

INDIANAPOLIS, Jan. 5—Another revision of prices is announced by the Nordyke & Marmon Co., on the entire line of Marmon cars. The prices, effective Jan. 3, are:

	Old Price	New Price
4 passenger Roadster...	\$3,985	\$3,700
4 passenger Touring car	3,985	3,700
7 passenger Touring car	3,985	3,700
7 passenger Sedan.....	5,425	5,150
4 passenger Coupe.....	4,875	4,700
Speedster	4,185	3,900
Suburban	5,425	5,300

The new reductions represent total cuts ranging from \$1,300 to \$1,500 within a year.

Hanson Announces Cut on Open and Closed Cars

ATLANTA, GA., Jan. 3—Price reductions of \$200 on all open cars and \$300 on all closed cars, effective Jan. 1, are announced by the Hanson Motor Co. The prices are:

	Old Price	New Price
2 passenger touring.....	\$1,795	\$1,595
5 passenger touring.....	1,795	1,595
7 passenger touring.....	1,995	1,795
4 passenger coupe.....	2,775	2,475
Sedan	2,885	2,585

Models of the Hanson "little six" which will be displayed at the New York and Chicago shows has been completed. The price will be \$995.

STEWART PRICES DROP

BUFFALO, Jan. 3—The Stewart Motor Corp. has reduced the prices of its various models. The schedule follows:

Model	Old Price	New Price
3/4 ton.....	\$1,395	\$1,195
1 ton.....	1,875	1,395
1 1/2 ton.....	2,200	1,790
2 ton.....	2,800	2,090
2 1/2 ton.....	2,950	2,290
3 1/2 ton.....	3,850	3,090

HANDLEY-KNIGHT REDUCED

KALAMAZOO, Jan. 3—Price reductions are announced by the Handley-Knight Co. They are:

	Old Price	New Price
Touring car.....	\$2,850	\$2,450
Coupe	4,150	3,750
Sedan	4,150	3,750

Two new models have been added to the line. They are a sedan-coupe selling at \$3,750 and a five-passenger touring car selling at \$2,250.

DENBY MAKES CHANGES

DETROIT, Jan. 3—Effective Jan. 1, another reduction in prices was made by the Denby Motor Truck Co. The prices follow:

Model	Old Price	New Price
3 1/4 ton.....	\$1,625	\$1,485
1 1/2-2 ton.....	2,300	2,145
2 ton.....	2,600	2,395
2 1/2-3 ton.....	2,795	
4 ton.....	4,200	3,895
5 ton.....	4,850	4,295
7 ton.....	5,500	4,945

These reductions, together with those made July 1 last, bring Denby trucks back to pre-war prices.

MAXWELL TRUCK DOWN \$400

DETROIT, Jan. 4—The Maxwell Motor Corp. has reduced the price of its 1 1/2-ton truck by \$400 on all models. The range now is from \$932 on the chassis to \$1,385.50 on fully equipped models.

SAXON LISTS REVISED

DETROIT, Jan. 4—The Saxon Motor Car Co. announces that it has reduced prices on its open and closed models. They are:

	Old Price	New Price
Runabout	\$1,295	\$1,195
Touring car.....	1,295	1,195
Coupe	1,995	1,795
Sedan	1,995	1,795

DAVIS INCREASES \$100

RICHMOND, IND., Jan. 4—The George W. Davis Motor Car Co. has increased the price of its touring car from \$1,695 to \$1,795.

ELGIN REVISES PRICES

ARGO, ILL., Jan. 5—The Elgin Motor Car Co. announces new prices effective immediately. They are as follows:

	Old Price	New Price
5 passenger touring car...	\$1,495	\$1,295
4 passenger scout.....	1,595	1,345
2 passenger roadster.....	1,595	1,345
5 passenger sedan.....	2,395	2,195
4 passenger coupe.....	2,395	2,195

R. & V. REDUCES 20 PER CENT

EAST MOLINE, ILL., Jan. 5—Reductions approximating 20 per cent are announced by the R. & V. Knights Motors Co. on its six-cylinder line. The prices are:

Roadster, 5-passenger and 7-passenger touring car, from \$3,350 to \$2,750.
Four passenger coupe, from \$4,000 to \$3,350.
Seven passenger sedan, from \$4,200 to \$3,450.

BIG LAFAYETTE CUT

INDIANAPOLIS, Jan. 5—Sweeping reductions of \$760 on the open models and \$1,350 on the enclosed models are announced by the R. & V. Knight Motors. The open models will now sell at \$4,090 as compared with \$4,850, and the enclosed at \$5,175 as compared with \$6,250.

BELGIUM REVISES TARIFF

LONDON, Dec. 24 (By Mail)—Belgium, to combat German dumping of automotive products in the country following the recent slump of the mark, has revised her tariff so that motor imports from Germany must pay from 24 to 40 per cent ad valorem. Exporters from other countries wishing to secure the benefit of normal rates of duty must send certificates of origin, duly legalized by the resident Belgian consul.

Akron Enters Year on Firm Footing

Tire Manufacturers in Instances Are Approaching Peak of Production

AKRON, Jan. 3—The rubber tire industry has emerged from the year's slump, has re-established itself upon a reasonably firm footing in the opinion of rubber manufacturers and has started the new year with production on a basis which, if remaining constant throughout the year, will mean the manufacture of close to forty millions of automobile and motor truck tires in 1922.

Tire production in Akron alone, according to an authentic check, now is averaging more than 100,000 tire units a day. This is the highest production point reached by the tire industry in 18 months, and compares favorably with the peak production obtained in the early months of 1920. If normal can be considered 75 per cent of the peak of 1920, then Akron's tire factories are back to normal and in most instances are above normal, with some even approaching the old peak which it had been predicted never again would be reached.

Spring Orders Received

The advent of the new year has brought with it a rush of spring orders from tire dealers and automobile manufacturers which, it is figured, will keep Akron's tire plants running at full blast for at least five months.

There is always a seasonal recession in production to be anticipated after the first spring rush is over, but basing predictions upon present conditions, a tire production for Akron alone in 1922 of at least 30,000,000 tires seems almost assured.

An official check in Akron shows that Akron factories alone turned out between 15,000,000 and 16,000,000 of the total production in the United States of 19,000,000 for 1921. Akron tire manufacturers report sales for 1921 aggregating more than \$3,000,000,000.

Surplus Absorbed

In addition to the manufacture of more than 15,000,000 tires here in 1921, the huge surplus of tires which existed a year ago, has been completely absorbed. Absorption of this surplus has meant the reduction of finished goods inventories in Akron alone to the extent of more than 2,000,000 tires and this in turn has released between \$40,000,000 and \$50,000,000, hitherto tied up in finished goods with no potential market therefore, to be re-applied to working capital.

Improved transportation facilities have been to some degree responsible for the heavy inventory reductions made. In some instances, finished goods inventories of Akron factories to-day are smaller than the actual number of tires these same companies were forced to keep in transit a year and two years ago.

Lincoln Taxes Due to Federal Blunder

Plant Was Assessed at Full War Cost Despite Law Covering Situation

WASHINGTON, Jan. 3—An unusual instance of blundering by the Government in the realm of taxation is revealed to-day in the decision Wednesday of the collector of internal revenue reducing taxes assessed against the Lincoln Motor Co. from \$4,500,000 to less than \$500,000.

It was the action of the Government on Nov. 4 last in assessing this tax which forced the Lincoln company into the hands of a receiver. The collapse of several smaller accessory corporations in Michigan and elsewhere, which were creditors of the Lincoln, and of a number of the distributing concerns, formed in other cities to handle the new car, followed immediately. In all it is estimated that business institutions of a total capital value of \$12,000,000 were involved.

Plant Built with Government Funds

Now, only a little more than a month later, the Government has decided it was a mistake, and that the major portion of the tax should not have been assessed.

The action of the Government in pressing the tax assessment in November is all the more startling in light of the history of the Lincoln company. The plant was built almost entirely with money advanced by the Government for the purpose of manufacturing Liberty airplane motors. It produced 6500 of these motors before the armistice, when it was just beginning to reach its maximum of production. When the Government no longer needed the plant for its war purpose it was sold to the Lincoln Motor Co., a Delaware corporation.

The sale price represented approximately 55 per cent of cost. The reduced price, of course, was due to the abnormal construction costs prevailing during the war period and the recognized necessity of the material transformation of the property by its purchasers to adapt it to automobile construction.

In effect, the Government came along some time thereafter and assessed the plant for purposes of taxation at its full war cost. It denominated as profit the difference between the original cost and the subsequent 55 per cent sale price and assessed a tax on this profit at the maximum rate of 80 per cent.

Law Covered Case

The 1918 tax law plainly intended to provide for this specific situation. It declared in effect that a manufacturer producing materials exclusively for war purposes was allowed to deduct from his income within three years after the war the loss represented by depreciation from the abnormal war cost of his plant.

At the moment when the tax was levied, in November, officials of the Lin-

SHOW TO DISCLOSE TWELVE NEW MAKES

NEW YORK, Jan. 3—Twelve cars never before seen at the New York Automobile Show will be shown this year. Ten of them are home products and two are made abroad. The new American cars are the Ambassador, Bournonville, Durant, Earl, Goodspeed, Handley-Knight, Kelsey, Leach-Biltwell, Rickenbacker and Wills Sainte Claire. The foreign cars are the Itala, an Italian product, and the Vauxhall, which was made in Canada.

coln company were in New York, where they had about closed negotiations for a loan sufficient to carry the company through until spring, when it was believed that reviving business would enable it to carry itself. The immediate effect of the assessment was to destroy the credit of the company. In the face of it no one would make a loan.

Shipments by Rail Show Loss in Third Quarter

WASHINGTON, Jan. 3—Comparison of freight commodity statistics of railroads having an annual operating revenue above \$1,000,000 shows a decline of 6,773 carloads and 13,814 net tons of automobiles and motor trucks classified as revenue freight during the third quarter of 1921, ended Sept. 30, as against a similar period of last year.

These figures do not clearly reflect the effect of freight rate increases which became effective Aug. 26, 1920, as the figures for the third quarter of 1920 included only one month of high freight rates. It indicates, however, a tendency to ship motor vehicles on their own power because of the excessive freight charges.

The statistics for the third quarter of 1921 show that 108,942 carloads and 879,771 net tons of automobiles and motor trucks were carried as revenue freight, originating on various roads. Agricultural implements and vehicles other than automotive showed a total loading of 26,129 carloads for the third quarter of 1921, as against 63,657 carloads for the same period last year.

STOCK SENT INVESTORS

MILWAUKEE, Jan. 2—Following issuance of warrants charging larceny as bailee against Orson A. Towle, known as vice-president of the Holmes Air-Cooled Motor Car Corp., Canton, Ohio, the district attorney of Milwaukee County has received telegrams from the company explaining that the stock purchased by the complainants in the cases and other purchasers in Milwaukee has been sent from the corporation's offices. The delay also is explained. Up to this time there has been no service of the warrants for Towle, who left Milwaukee several months ago.

\$8,000,000 Offered for Lincoln Plant

If Accepted, Lelands Will Continue in Charge and Receivership Be Lifted

DETROIT, Jan. 3—Lincoln cars will continue to be "Leland built" under the plans of the group which offered \$8,000,000 for the Lincoln Motor Co. property in Federal Court here this week. The offer was made by Harold H. Emmons, attorney for the company, who said he was acting for "persons interested in getting the company back on its feet."

The first offer of the group was of \$5,000,000 for the unencumbered property of the company and this was increased to \$8,000,000 following the fixing of this figure by the court as the upset price. Date of sale was set for Feb. 4. The appraised value of the company is \$11,000,000 and its liabilities approximate \$10,000,000.

Original Offer \$5,000,000

The original offer of \$5,000,000 caused such a storm among attorneys representing different classes of shareholders and creditors that Judge Tuttle decided to raise the upset price to \$8,000,000.

One attorney asserted the \$5,000,000 would pay only half the debt and wipe out the shareholders of the "A" and "B" classes. Another contended that \$5,000,000 would pay only about 22 cents on the dollar to creditors. He estimated the liabilities at \$9,000,000 and said that when preferred creditors were paid there would remain only about \$2,000,000 for the remainder.

If the group, represented by himself, is successful in acquiring the property, Emmons said, the Lelands will be continued in the active management of the company. Speedy lifting of the receivership and the continuance of manufacturing by the company is important to keep the sales organization intact, he said. With the company again in control, the impression is that an early revision in prices may be expected which would place the Lincoln in a much more active selling class.

The slash in assets made by the appraisers has had the highly desirable effect of placing the company on a strictly present day valuation basis.

Officials of the Treasury Department at Washington will be asked by the receiver to consider the writing off of the \$500,000 balance remaining on the original \$4,500,000 claimed for unpaid taxes. This will not be a formal appeal from the decision reducing the claim to \$500,000 but the writing off will be presented as greatly facilitating the recovery of the company. Stockholders and creditors considered the offer of \$8,000,000 for the company made by Emmons at an informal meeting to-day, with a view to determining their attitude on the proposed purchase. There is a likelihood of another bid being entered from this quarter.

Factories Operate on a Sales Basis

With Most Plants Production Was
at Standstill During
December

DETROIT, Jan. 4.—Production in December, except for a few factories, was practically at a standstill, though a number of factories kept on a sales basis in the early part of the month. This activity gradually dwindled as the holidays approached, so that from the 20th on there was almost a complete cessation of production in all plants.

Ford Motor Co., prior to closing for inventory, on the 21st, had been running along replenishing parts stocks with minor activity in assembling. Sales for the month will approximate 50,000 cars.

Maxwell has continued steadily in the manufacture of its new model, turning out about from 100 to 150 daily throughout the month except for a few days of inventory taking. Preparations were made to get into production early in January on the new Chalmers, models of which will be shown for the first time at New York.

Dodge Brothers, while assembling and shipping 100 to 150 cars a day, was making parts for about 450 vehicles daily in anticipation of a strong early spring demand. Dealer stocks are low, shipments having been held by the company to a sales basis. The fact that stocking has not been done has been responsible in large part for the report that an early cut of Dodge Brothers prices may be expected.

Buick, working on about a half time basis throughout the month, has been the most active of General Motors units.

Cadillac production and shipments fell off early in the month.

Chevrolet has maintained an active front, and Oakland and Oldsmobile have been moving along slowly.

Studebaker, after closing for inventory early in the month, has been gradually working back to a production point which is expected to reach early in 1922 the record breaking proportions of 1921.

Hudson and Essex have been working along on about a half time basis for the month and with new prices on all lines now effective are tuning up for heavy production following the shows.

Reo has been operating on a sales basis throughout the latter part of the year, December operations being on about a 50 per cent basis, speed-wagon business has shown consistent gains and with the addition of the special taxicab model to its line, the company looks for another stable business producer.

Earl Motors, Inc., under the impetus of its new models and widely strengthened dealer organization, maintained a steady production schedule throughout the month and will increase this during January.

Hupp, Paige, Liberty, Dort, Columbia and Saxon have been operating on part

1922 PREDICTED YEAR OF GROWTH

By Charles Clifton, President,
National Automobile Chamber
of Commerce

NEW YORK, Jan. 4—Nineteen hundred and twenty-two will be a year of growth. The production of 1921 probably will not be exceeded in 1922; but this is only one particular in the scope of motor transportation.

More attention will be paid to the needs of the individual owner. The repair parts business of the factories will be better organized. Governmental and other agencies will carry on studies of transportation costs which will affect owner economies. Road development will give the motorist more value per vehicle. The export market will be better. In fact, if the allied debt is refunded, foreign trade will be measurably improved as the exchange rate will then readjust differences in currencies on a basis of comparative purchasing power.

Many companies are giving and have given splendid service to their owners, but for the industry as a whole there is great opportunity for growth. It is a complex situation to deal with, because good service to the owner is a matter of personal contact with the local man in the field. Fortunately, time is gradually eliminating those local shops which have not served the customer well. Time also is giving the local man a chance to know what the motorist wants. Nineteen hundred and twenty-two will give many factories an opportunity to study their service situations throughout the country and to aid their local dealers in giving satisfaction to the car owner.

time on a sales basis only, but steadily strengthening their dealer organizations in anticipation of early 1922 business.

Packard reports both car and truck business in December as in excess of November and considerably in excess of business in December, 1920.

Wills Sainte Claire, Handley Knight and Roamer, in the higher price class, have moved along slowly during the month, but report a share in the general business consistent with the time of the year.

NASH GIVES ENGINE FOR STUDY

MILWAUKEE, Jan. 2—The Nash Motors Co., four-cylinder car division, has presented the college of engineering of Marquette University in this city with a Nash four-cylinder engine and transmission for installation in its laboratory of mechanical devices for practical use and study.

Clarence A. Pfeffer Resigns from Saxon

Affairs of Company Will Be in
Charge of Vice-President
Temporarily

DETROIT, Jan. 4—The resignation of Clarence A. Pfeffer as president of the Saxon Motor Car Co. has been accepted by the board of directors. Until a successor is chosen the affairs of the company will be in charge of Harry L. Bill, vice-president and general manager. It is understood that the directors have practically decided upon the man who will take over the destinies of the company and he is said to be thoroughly experienced in financial affairs. The company will undergo several constructive changes under the new administration, it is declared.

The resignation of Pfeffer brings to an end three years of service for the reorganized Saxon company. For the present he will act as a business consultant, specializing in the automotive industry.

It has been understood that the Saxon company would be one of about 20 corporations taken over by the Associated Motor Industries, a Delaware corporation, which has acquired the assets of the Jackson Motors Corp.

Japan Manifesting Greater Interest in Small Tractors

LOS ANGELES, Jan. 4—The tractor is beginning to attract greater attention in Japan, although the market is by no means an attractive one. The increasing interest was manifested at the recent tractor demonstration conducted by the Department of Agriculture and Commerce of Japan at the government experiment station at Takinogawa, on the outskirts of Tokio.

All importers and dealers holding foreign tractor agencies in Japan competed at the demonstration. Each tractor was required to turn up a specified amount of ground. No results were announced, as is usual in the Japanese government tests, but it is known that the government officials showed more interest in the performance of the smaller tractors and cultivators than in the larger sizes of either.

EARL MOTORS NOT AFFECTED

JACKSON, MICH., Jan. 3—Clarence A. Earl, declared to-day that Earl Motors, Inc., is not affected in any way by the difficulties of the Fort Dearborn banks in Chicago. He stated the company is free from all entanglements and declared that the resignation of John Fletcher, vice-president of the Fort Dearborn bank, as treasurer of Earl Motors, effective Dec. 31, was only incidental to the troubles of the bank as Fletcher desires to devote his entire attention to his banking interests.

Program Completed for S. A. E. Meeting

Twenty-two Papers Will Be Presented at Three Days' Session

NEW YORK, Jan. 3—Twenty-two papers will be presented at the technical sessions of the Society of Automotive Engineers incident to its annual meeting in the Engineering Societies Building Jan. 10 to 13.

The session Wednesday morning, Jan. 11 promises to be one of the most interesting and important of the meeting, H. C. Dickinson delivering a short talk on automotive research in 1922. His remarks will be followed by several brief papers by engineers prominent in aviation, automobile, tractor, motor boat and stationary engine fields. These speakers will endeavor to predict the progress in 1922 in their respective fields. President David Beecroft will terminate the session with a talk bearing on the status of the automotive engineer in the economics of his industry.

To Discuss Air-Cooled Engines

Charles Lawrence will present a paper at the aeronautic session Tuesday evening when discussion will be devoted entirely to the development of air-cooled engines for aircraft.

Harmony in upholstery will be covered in a paper by R. S. Quaintance at the session the following afternoon; George E. Goddard will present a paper containing recommendations for body seating dimensions, and L. V. Pulsifer will treat of the application of body paints and varnishes. The California top will be discussed by P. W. Steinbeck.

The same afternoon the motor truck transportation session will be held when consideration of the possibilities of the motor bus will take up a major part of the time. Walter Jackson will lead the discussion on this subject. The economics of motor truck transport will be treated by M. C. Horine. At the lubricating session, to be held simultaneously, W. H. Herschel of the Bureau of Standards will speak on viscosity and friction; Neil MacCull of the Texas Co. will take up the relation between fluid friction and transmission efficiency, and Prof. Robert Wilson of the Massachusetts Institute of Technology, and Daniel P. Barnard will present a joint paper on the mechanism of lubrication, as the result of extensive research.

Harry Ricardo to Speak

The paper of Harry Ricardo of Great Britain, to be given at the Thursday morning session will cover many phases of automotive engineering, most of them confined to the power plant. At the fuel and engine session in the afternoon, Thomas Midgley, Jr., and T. A. Boyd will compare the past methods of measuring detonation. O. C. Berry and C. S. Kegerreis will outline the results of

NOVEMBER OUTPUT AGGREGATED 106,043

NEW YORK, Jan. 4—Production of passenger automobiles in the United States for November was 106,043. Truck production was approximately 10,000. The month's total of 116,043 showed a decline of 30,893 from October.

tests made at Purdue University on the vaporization of petroleum fuels and factors affecting exhaust temperatures. Midgley and W. K. Gilkie will supplement the material contained in the pre-print of their paper on spectroscopy with actual data which have been collected by them from recent tests.

G. R. Norton will describe a new forging process at the materials session on Thursday afternoon. The steady improvement in the uniformity and reliability of malleable iron castings will be the topic of a paper by Enrique Touceda. C. N. Dawe will speak on the application of chrome molybdenum steel to automotive construction from the consumers' standpoint, and J. H. Nelson will make recommendations regarding practice in drop forgings.

J. E. Schipper and S. von Ammon will present papers at the passenger car session to be held Friday, which will be devoted to the treatment of motor car brakes. At the same session Prof. Augustus Trowbridge of Princeton University will describe an indicating device and its applications in engine testing.

Morris Syndicate Buys Harley Co. for \$1,100,000

SPRINGFIELD, MASS., Jan. 4—Transfer of the Harley Co. from the Hendee Mfg. Co. to a syndicate headed by A. W. Morris, formerly production manager of the Harley Co., has been completed. The sum of \$1,100,000 was involved. Associated with Morris are R. E. Northway of Boston, who recently retired as vice-president and director of Northway Motors Corp., Charles H. Burr of Philadelphia and J. A. Young of Fredonia, N. Y.

Morris has accepted the presidency of the new company and will install his high pressure die casting process used successfully during the war for casting all metals. In addition to casting work, the company will handle a variety of drop forgings up to medium size crank and camshafts. In addition to its own plant it has a close connection with a company in Bridgeport, Conn., which has a large machine shop and will be in a position to finish automotive parts or complete assemblies.

The new company will have headquarters at the Commodore Hotel during show week and will be represented there by Morris, Northway and J. A. Young, formerly eastern representative of the Sheldon Axle Co.

November Exports of Tires Increased

Foreign Shipments for 11 Months of Year Totaled \$14,562,890 —United Kingdom Led

WASHINGTON, Jan 3—A material improvement was shown during the month of November in the foreign sales of American made automobile tires, the total for the month having reached \$1,677,678, as compared with \$1,447,268 in October, according to a statement of Bureau of Foreign and Domestic Commerce.

The leading countries figuring in the November totals were the United Kingdom, Mexico, New Zealand, Cuba, Philippine Islands, Argentina, Sweden, South Africa, British West Indies, Spain, Denmark and Panama, in the order that they are named.

The total was divided as follows: Casings, \$1,474,065; inner tubes, \$115,411 and solid tires, \$88,211. Details of the shipments are as follows:

Belgium	574
Denmark	24,694
France	13,940
Italy
Netherlands	17,781
Norway	8,694
Spain	25,484
Sweden	52,493
Switzerland	6,737
United Kingdom	710,899
Canada	15,379
Panama	18,531
Mexico	172,898
British West Indies	31,666
Cuba	62,097
Argentina	53,024
Brazil	5,472
Chile	6,827
Peru	12,383
Uruguay	12,295
Venezuela	11,323
China	7,027
British India	17,839
Straits Settlements	8,061
Dutch East Indies	3,300
Japan	28,466
Australia	16,388
New Zealand	78,459
Philippine Islands	55,099
British West Africa	12,702
British South Africa	39,313
Other countries	147,833

Tire exports for the eleven months of 1921, ending Nov. 30, totaled \$14,562,890.

CALIFORNIA SALES INCREASE

LOS ANGELES, Jan. 4—New automobiles sold in the eleven counties of southern California from Jan. 1 to Nov. 30, 1921, totaled 51,226 as compared with 43,148 in the same period of 1920. Los Angeles County absorbed 35,850 of the total. Sales of motor trucks in the same territory for the same period totaled 5646, of which 2794 were sold in Los Angeles County. Ford sales of passenger cars in southern California totaled 22,911. The other sales leaders in order were Chevrolet, Studebaker, Dodge, Buick, Overland and Oldsmobile.

FINANCIAL NOTES

General Tire & Rubber Co. during the past year, according to its annual statement, wiped out a bank indebtedness of \$1,400,000 and at the close of the year reported current assets of \$1,846,969, including \$182,015 in cash and an inventory appraised at \$465,191. Fixed assets of the company total \$566,864. Total assets are \$2,460,189. The company lists \$329,686 in notes and \$868,569 in accounts receivable and accounts payable of \$94,000. Production has been increased to 1500 tires a day, its general sales for 1921 exceeding \$6,000,000 in money value, while in tire units they exceeded those of 1920 by more than 50 per cent.

Moline Plow Co. reorganization committee states in a letter to creditors and security holders that \$3,612,000 of the \$4,000,000 serial notes outstanding have been deposited under the plan and others are coming daily. All bank creditors have accepted the plan and the assent of the merchandise creditors is expected at an early date. Of the 75,000 shares of old first preferred stock 67,463 shares have been deposited, also 14,901 shares of the 15,000 shares of second preferred stock and 13,818 shares of the 18,000 common stock. Common stock deposited does not include that held by Willys-Overland interests.

Spicer Mfg. Co. for the twelve months ended Dec. 31, 1921, will show a slight profit after interest charges, but before depreciation. For the year ended Dec. 31, 1920, earnings were \$646,022 on the \$3,000,000 8 per cent preferred and \$7,375,000 common. Inventory position is better than for some time past. All raw materials and supplies are carried at cost or market, whichever is lower, and the policy is to purchase as current needs present themselves. The company expects to be operating at 80 per cent by March of this year.

Earl Motors, Inc., and subsidiary companies consolidated balance sheet giving effect as of Aug. 31, 1921, to the proceeds of the recent sale of \$2,500,000 7½ per cent debentures and 200,000 shares of common stock shows inventories, \$2,390,683; notes and account receivable, \$343,997; cash, \$834,166, and deferred charges, \$356,877, among the assets. The liabilities include notes payable, \$377,191; accounts payable, \$566,578; dealers' deposits, \$41,001, and provision for price adjustment, \$50,000.

Pierce-Arrow Motor Car Co. earned a small profit in October and November this year after operating at a loss since September, 1920. Business fell off somewhat this month, but probably not sufficiently to wipe out earnings in the two preceding months, indicating a slight profit for the current quarter. In the three months ended Sept. 30, 1921, a deficit of \$2,110,000 was reported. With the loss of \$1,890,000 in the first half deficit for nine months aggregated \$4,000,000.

Kelly-Springfield Tire Co. directors have decided to pass the regular quarterly dividend of 3 per cent, payable in stock. The last cash quarterly dividend paid on the common issue was \$1 in February, 1921. The unsatisfactory earnings of the year are the result of the cost of starting the new plant at Cumberland, Md., and the adjustments of tire prices. It is understood that sales last week were the largest in the history of the company.

Republic Rubber Corp., through Receiver Booth, has been authorized by the Federal court to issue \$1,000,000 of receiver's certificates. It is understood banks have agreed to take the issue. The financing is for the

purpose of continuing operations and creditors have concurred in the action.

Kalamazoo Motors Corp. has issued \$250,000 7 per cent gold bonds to mature in five years and salable at any interest bearing date at 103 and accrued interest. The First National Bank of Kalamazoo is trustee of the issue.

American Bosch Magneto Corp. shows current liabilities Oct. 31, 1921, of \$475,000 and cash and receivables \$1,400,000.

Kelsey Wheel Co. has declared a regular quarterly dividend of \$1.75 on the preferred stock payable Feb. 1.

Greater Output and Sales Seen by Cleveland Industry

CLEVELAND, Jan. 3—Cleveland automobile manufacturers, with no exception, look to 1922 to bring an increase both in production and sales.

Bankers here take the same view, also predicting that general business conditions will improve during the year.

Local automobile manufacturers enter the year on foundations that all admit are much stronger than those on which they started 1921.

In the first place, the makers are down to a strict economy basis. All have made big savings on labor and shop overhead. Arrangements have been re-arranged to lower the cost of handling materials and to reduce factory distribution costs. Moreover, the manufacturers have planned new models, price reductions and improved cars as mediums for attracting more business.

Omits Liability Release in New Bill of Lading

NEW YORK, Jan. 4—The new form of domestic bill of lading prescribed by the Interstate Commerce Commission omits the paragraph in the present bill of lading which tends to release carriers from liability for loss or damage to shipments on open cars. This is a point for which the National Automobile Chamber of Commerce contended in the bill of lading proceedings by giving testimony of the extent of open car shipments of motor vehicles and the inability of carriers to furnish automobile cars.

The traffic committee of the N. A. C. C. has filed with the Interstate Commerce Commission a request to be heard on the subject of freight rate revision.

WILL DISCUSS SHORT HAUL

NEW YORK, Jan. 3—A. J. Brosseau, president of the International Motor Truck Co., will be the principal speaker at a meeting of the Shipping Conference of Greater New York at the headquarters of the Merchants Association at 2:30 p. m., Jan. 10. His subject will be "The Short Haul," and he will outline some of the advantages of the motor truck in this connection. Traffic managers of all the large shipping companies in New York will be present and W. J. L. Banham, general traffic manager of the Otis Elevator Co., will be chairman of the meeting.

BANK CREDITS

Written exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Co., second largest bank in America.

During the past week the money market was characterized by a small volume of transactions and general quietness in trading. The rate quoted for call money was 4½ per cent to 6 per cent as compared with 5 per cent to 6 per cent in the previous week. The quotations for fixed-date maturities from 60 days to 6 months remained unchanged at 5 per cent to 5½ per cent, while prime commercial paper also remained unchanged at 5 per cent to 5½ per cent.

Two notable features of development in the Federal Reserve banking field during the past year have been the large increase of gold reserves, over \$810,000,000, since Dec. 30, 1920, and the reduction by over 25 per cent in the volume of Federal Reserve note circulation. The Federal Reserve statement as of Dec. 28, 1921, showed a decrease of \$1,394,000 in gold reserves from the figure of the previous week, and an increase of \$534,000 in other cash reserves.

As a net result of these changes the total reserves decreased \$860,000. Total earning assets decreased \$27,422,000 as a result of the following changes: A decrease of \$57,155,000 in total bills on hand; an increase of \$8,388,000 in United States bonds and notes, and an increase of \$21,345,000 in all other notes except Pittman one-year certificates. The total amount of Federal Reserve notes in circulation decreased \$4,063,000, and total deposits decreased \$20,226,000. The reserve ratio increased from 70.7 per cent to 71.1 per cent.

The total reserves of the New York institution increased \$9,925,000, while total bills on hand showed a reduction of \$37,827,000. Total earning assets declined \$18,849,000, and total deposits \$6,881,000. Federal Reserve notes in circulation decreased \$3,242,000. The ratio of total reserves to deposit and Federal Reserve note liabilities combined increased from 79.5 per cent to 80.8 per cent, while the ratio of gold reserves to Federal Reserve notes in circulation, after setting aside 35 per cent against deposit liabilities, increased from 127.7 per cent to 130.2 per cent.

CLIMBER TO INCREASE OUTPUT

LITTLE ROCK, Jan. 3—H. F. Buhler, president of the Climber Motor Corp., states that plans are being perfected to increase production at the factory, and that possibly a branch or two will be established for the manufacture of cars. He says that the prospects for 1922 are very encouraging, with indications of a fairly good export business.

The factory was in operation throughout 1921, but the output was limited because of the depression. However, the year resulted in earnings being made, due to the cutting down of forces, the practicing of economy in every department and the reduction of overhead expense in every way possible.

INDUSTRIAL NOTES

Velle Motors Corp., Moline, Ill., opened the year with 500 men employed and a production schedule of 500 cars monthly, this to be increased to 800 in the spring. General manager F. E. Bradfield states that the orders on hand call for 1,600 cars. During the fall the company added enamel, windshield and clutch departments. With the recent addition of a motor factory at Marion, Ind., the company is able to produce cars entirely within its own plant, or affiliated plants in Moline, this keeping overhead to the minimum and saving time and labor.

Century-Plainfield Tire Co. and Rubber Insulated Metals Co., Plainfield, N. J., have been disposed of at public sale to Mrs. Agnes Dana of Bernardsville, a creditor and large stockholder, for \$100,000. The Chancery Court decree under which the sale was held was \$536,000, representing mortgages and other claims against land and buildings. The companies were formed during the war and at one time employed 1,000 men. This year a receiver was named and an attempt at reorganization was made.

Westmore Mechanical Laboratory Co., Milwaukee, organized in 1915 by Charles P. Wetmore, president and P. B. Rogers, secretary, is again actively engaged in engineering and manufacturing work, devoting its efforts to the developing of mechanical devices and in the perfecting of manufacturing methods, including jigs, fixtures and tool work. The company is manufacturing several articles for companies in which it has also become a stockholder.

C. G. Spring Co., Kalamazoo, has been closed down for the last ten days to allow facilities for a greatly increased production schedule. A large force is completely rearranging the bumper unit, providing for the most economical handling of production. Resumption of operations will be made at the earliest possible date. It is reported that the company has sufficient orders to keep it operating steadily until April.

Chandler Motor Co. during the past year shipped approximately 5,000 cars compared with 23,832 in 1920 and 18,476 in 1919. It is stated that retail sales to the public, however, have reached about 65 per cent of the record years of 1919 and 1920. At the beginning of 1921 dealers had in the neighborhood of 6,000 cars on hand whereas today, it is reported, the same dealers have hardly one car apiece on hand.

International Harvester Co. has gradually added machinists to the forces at its Akron plant and has advertised for former employees to communicate with it, with the purpose of making ready for increased business. It is believed that the daily output will be close to 50 tractors a day early in the year. During the latter part of 1921 the company made every effort to work down completed inventory.

Goodyear Tire & Rubber Co., in a New Year message to its dealers, states that despite difficulties during the past year it would be apparent when the books were closed on Dec. 31 that it would have sold more goods through dealers than in any previous year.

Cole Motor Co. reports that October shipments for 1921 exceeded those for the same period in 1920 by 100 per cent; November, the same period in 1920, 200 per cent; December, 500 per cent and that 1920 was the second biggest year in the history of the company.

Gall Auto Specialty Co., Denver, has been appointed distributor of the Timken-Detroit Axle Co. It is also distributor for Continental motors and parts, Borg & Beck clutches, Spicer universal joints, Bosch magnetos and Zenith carbureters.

Fulto Auto Body Co., Atlanta, has opened its new plant manufacturing custom made bodies and sport bodies for the Ford chassis. The company is headed by Charles Drager and sells mainly through dealers in the southeastern territory.

Double Fabric Tire Co., Auburn, Ind., is operating on full time, increasing its working schedule from two eight-hour shifts a day to a ten-hour day shift and a ten-hour night shift.

Frank Held Tractor Co., which has been in active operation in Columbus, Ohio, for a year, has acquired additional plant facilities for the manufacture of a tractor which is especially designed for the truck gardener.

Sundby Battery Co. of Milwaukee has been incorporated with an authorized capital stock of \$500,000 to manufacture storage batteries and similar automotive specialties.

MacDonald Steam Automotor Car Co., Garfield, Ohio, is planning additions to its plant to permit of a production of 1,000 cars this year.

Car Registration Gain 43,662 in Wisconsin

MILWAUKEE, Jan. 3—Passenger car registrations in Wisconsin in 1921 showed a net gain of 43,662 over those in 1920, while motor trucks gained 5100 and there was a loss of 1567 in motorcycles. There were 176 more dealers licensed in 1921 than in the previous year. At the close of business, the Secretary of State at Madison showed a total registration of 320,755 passenger cars; 21,305 trucks; 6435 motorcycles and 2122 dealers. All Wisconsin licenses are annual and expire Dec. 31 each year, regardless of the time of year issued.

The 1921 increase of 43,662 in the number of passenger cars registered was exceeded twice before. In 1920 there were registered exactly 53,000 more passenger cars than in 1919. In 1917, a gain of 48,886 cars over 1916 was established.

Pennsylvania Shatters Registration Records

HARRISBURG, Jan. 3—Registration of motor vehicles in the State during 1921 broke all records. During the year 110,706 more passenger cars were registered than in 1920 and the total revenue was almost \$1,400,000 greater.

A comparison of automobile license registration figures follows: In 1921—Passenger cars, 632,541; motor trucks, 57,048; motorcycles, 21,111. In 1920—Passenger cars, 521,835; motor trucks, 48,329; motorcycles, 23,981.

FAVOR ROAD REFERENDUM

TRENTON, Jan. 3—Republican members of the New Jersey legislature have decided to recommend the passage of the bill which would place before the people of the state next fall a referendum on a bond issue for \$50,000,000 for an improved system of state highways.

Cooperative Move Opens Bus Terminal

Portland System Covers 21 Cities —Operated Under Regular Schedule

PORTLAND, Jan. 3—Portland's new automobile bus depot, in the heart of the city and one of the busiest and most complete depots of the kind in the country, was opened for use last week, and now is running full swing. The depot is owned by a corporation formed by bus line owners, and represents the fruits of a co-operative movement on the part of the operators.

Although the present schedule of operations from the bus depot is declared to be merely a beginning, there are already over 100 different buses leaving the terminal daily, many of them making two or three trips. Under the schedule bus lines are operating to every city of any importance within a radius of 100 miles from Portland.

The terminal resembles a railroad depot, with waiting rooms, ticket office, announcer, etc. At the rear of the building is a covered platform with drive-in from the street, where the buses load or unload. Under the arrangement the patrons remain in the waiting room until the bus drives up to the platform. The bus is then announced and the patrons pass through the door and take their seats, just as they would in a train. Regular time tables are maintained.

There will be no such thing as making patrons wait for a later scheduled stage in case the car which they hoped to take is filled before they secure seats, it is announced. Several stages will be kept in reserve at all times, and in case the regular stage is not sufficient to carry all who have secured tickets a reserve stage or stages will be brought up.

Under the present schedule, which will probably be enlarged as the terminal expands, 150 departures in 21 different directions are provided. This gives many of the closer towns hourly bus service, while the more distant points are served by two buses a day.

Two Races Scheduled for French Grand Prix

PARIS, Dec. 23 (By Mail)—Strasbourg has been selected as the scene of the French Grand Prix races on July 15 and 16. There will be two distinct events, the first one being for racing cars of not more than 122 cubic inch piston displacement, with a minimum weight of 1433 pounds, and the second one for fast touring cars with a minimum weight of 3086 pounds, which will be given a supply of gasoline and oil equivalent to 18.7 miles per gallon.

German cars will be seen for the first time in a big European road race next September, when the European 183 cubic inch Grand Prix will be run over a short course near Milan, Italy.

MEN OF THE INDUSTRY

Captain Robert W. A. Brewer, consulting engineer, of New York, who previous to the war resided in London and who during the war was an inspector of motor apparatus in New York for Great Britain, has been awarded the Bessemer premium of the Society of Engineers, one of the oldest engineering societies. This award is in recognition of his engineering work in America during the war, some of which was described in a paper which he read in London in March, 1921. The paper dealt principally with the manufacture of thermionic valves for radio telephones for airplanes, which were constructed in large numbers under his supervision. Ten years ago he received similar recognition for his work on "two stroke cycle engines" and in 1907 was awarded the gold medal of the society for his work in connection with the use of "liquid fuel for internal combustion engines."

Roy McNamara, widely known as a road engineer and automotive expert, has joined the staff of the Rickenbacker Motor Co. as experimental engineer. For several years McNamara acted as experimental engineer for the Maxwell and Chalmers companies. He is credited with having crossed the continent thirteen times in a motor vehicle and is said to have a total road mileage of nearly 1,000,000 miles. Although he never sought racing honors, he has taken part in many endurance contests.

N. W. Cummins, who entered the service of the Miller Lock Co. Sept. 1, 1921, as head of the automotive department, has been made a vice-president of the company in charge of automotive equipment. He received his early training with the E. J. Manville Machine Co., and until he joined the Burns & Bassick Co. to develop a line of automotive products was associated with the Scoville Mfg. Co., the Keystone Watch Case Co., and the Bowen Products Corp. He was a vice-president and director of the Bassick company.

Frank L. Campbell has been appointed sales manager of the United States Chain & Forging Co. of Pittsburgh, succeeding C. M. Power, resigned. He was formerly associated with the Beaver board companies of Buffalo and prior to that was connected with the Cambria Steel Co. and John Lucas & Co., Inc., Philadelphia.

J. J. Kennedy, for the past five years with the Champion Spark Plug Co., in charge of New England sales, has resigned to accept the position as sales manager of Bell Manufacturing Co., Boston, which will market a high grade timer for Ford cars. Kennedy has been associated with the automotive industry since 1907.

L. E. Averill has resigned as safety engineer of the Saginaw Products Co. to take charge of safety work for the Oakland Motor Car Co. **E. F. Vogt**, personnel director of the Saginaw company, has been named his successor.

Ray C. Chidester has resigned as manager of the Milwaukee branch of the Packard Motor Car Co. to assume management of Chidester-Flint, Inc., that city, distributor of the Durant in Wisconsin and upper Michigan.

William C. Young, assistant manager of aeronautical sales of the Goodyear Tire & Rubber Co., has been appointed manager, succeeding Willard P. Seiberling, who has resigned to join the new Seiberling Rubber Co.

Claude Sauzedde has joined the Maxwell-Chalmers staff as designing engineer. He was formerly a designer with Dodge Brothers and previously was connected with the first general staff of General Motors Corp.

H. W. Scholl has been appointed sales manager of the Philbin Corp., Kennett Square, Pa. He was formerly connected with the Splitdorf Magneto Co. as salesman, export sales manager and sales manager.

F. C. Allen of the export department of the Firestone Tire & Rubber Co. is contemplating an extensive trip abroad, visiting the principal markets outside of Europe and South America.

W. C. Starkey has resigned as chief engineer of the Ohio Brass Co., Mansfield, to become vice-president and directing engineer of the Stevenson Gear Co., Indianapolis.

Roland Rohrs, American pilot and holder of several aeronautic world's records, has joined the Aeromarine Airways, commercial aviation organization.

CANADIAN PRODUCTS REOPENS
AFTER TAKING OF INVENTORY

DETROIT, Jan. 5—The Canadian products division of General Motors of Canada, Ltd., has resumed operations in its plant at Walkerville on an increased scale after being closed one week for inventory. It has been operated continuously for the past year, employing from 600 to 1000 men manufacturing motors and axles for Buick, Oldsmobile and Chevrolet cars. The expansion of operations is due to the new policy of General Motors to manufacture in Canada all cars of these lines which are sold in the export trade.

FORD SITE FOR WATER POWER

DETROIT, Jan. 5—Ford Motor Car Co. will begin in the spring the development of water power on the Menominee River, south of Iron Mountain. The site owned by Ford is said to be one of the best on the river.

CHAMPION PLANS SPEEDOMETER

DETROIT, Jan. 5—The Champion Ignition Co. soon will begin the manufacture of a speedometer which will require a large addition to the present plant at Flint.

MOTOR TRANSPORT TRAINS

LONDON, Dec. 24 (*By Mail*)—The proximity of the Manchester manufacturing center to the great seaport of Liverpool has led to such a rapid development of motor transport in Lancashire it has been suggested that an existing railroad should be converted into a motor road. At present three separate lines connect the two cities.

CORRECTION

NEW YORK, Jan. 4—It was stated in AUTOMOTIVE INDUSTRIES of Dec. 22 that the Lexington Motor Co. would display at the New York show a "light six" model which would sell in the neighborhood of \$1,300. Emery Huston, vice-president of the company, states that while a new model of the Lexington will be announced at the show, the price will be considerably more than \$1,300.

METAL MARKETS

WHILE the quota of tentative inquiries for automotive steels is fairly large, producers are not indulging in false hopes. They realize that buyers are combing the market extraordinarily fine for the most advantageous prices and that when orders are finally placed they will call for conservatively modest tonnages. They argue perfectly correctly, however, that eventually the aggregate force of this sort of buying will lead to more liberal commitments on the part of consumers. An important automotive interest has been canvassing the market for fine finished sheets for several weeks and sheet producers assert that this consumer has been unable to shade the 4.35c. base quotation.

They admit, however, that the specifications of this buyer are so exacting that, if the mills which can handle this business take it at the regular market quotation, they are making a concession. There is no denying the outward steadiness of the sheet market generally. That producers are averse to cutting under the regular market quotations at a time when they can confidently look forward to a certain quota of orders, even though they turn a deaf ear to buyers' entreaties for concessions, is only natural. At the same time there are some sheet rollers who seem more anxious than others for orders that will give them a comfortable operating rate from the year's outset.

It remains to be seen whether the present steadiness of the market will survive the eager competition for orders that may be expected to develop between individual mills. Plate mills will seek to obtain as large a share of the business in blue annealed sheets as possible and their production schedules are being laid out with this program in mind. Quite a few of the sheet mills are still obligated on contracts calling for black sheets at 2.75c. and blue annealed sheets at below the prevailing 2.25c. base quotation.

Stocks of cold-finished steel bars carried by automotive manufacturers are said to be adequate for first quarter requirements and a leading producer is quoted as having given up hope of representative business in that specialty materializing until next April.

Pig Iron.—The character of business coming into the pig iron market during the year's opening week continues to be unchanged from that of the closing weeks of 1921, buying being of decidedly retail proportions.

Steel.—Makers of cold-rolled strip steel are figuring on several fair-sized inquiries from automotive sources. Although a 300-ton order is said to have been placed recently at 3.75c. base Pittsburgh, it is understood that when contracts involve 500 tons monthly deliveries, 3.50c. base Pittsburgh, is the price named. Demand for hot-rolled is light. Philadelphia reports state that there is an inquiry for 10,000 tons of automobile sheets in the market, deliveries extending over the first half of the year. There has been so prolonged a lull in automotive demand for nuts and bolts that producers expect the placing of orders for liberal tonnages within the next few weeks.

Aluminum.—It is stated in brokerage circles that during the closing days of December some buying of virgin ingots, 98 to 99 per cent pure, took place at around 18c., deliveries covering the year's first half.

Copper.—Reports of an early resumption of mining activities by leading producers were followed on the heels by denials.

Calendar

SHOWS

Jan. 7-13—New York, National Automobile Show, Grand Central Palace, Auspices of N.A.C.C.

Jan. 9-14—New York, Motor Car Body Exposition, Automobile Body Builders Association, Twelfth Regiment Armory.

Jan. 28-Feb. 4—Chicago, Automobile Salon, Hotel Drake.

Jan. 28-Feb. 4—Chicago, National Automobile Show, Coliseum, Auspices of N.A.C.C.

Feb. 6 to 11—Seventh National Tractor Show and Educational Exposition, Minnesota State Fair Grounds, Minneapolis.

Feb. 6 to 11—Winnipeg, Can., Automotive Equipment Show, Western Canadian Automotive Association.

FOREIGN SHOWS

March, 1922—Santiago, Chile, Annual Automobile Show.

April 16—Mexico City, Annual Automobile Show, Auspices of the Automotive Division of the American Chamber of Commerce.

April 22-May 1—Prague, Czechoslovakia, Fourteenth International Automobile Exhibit.

May, 1922—Quito, Ecuador, Agricultural Exposition, celebrating Centenary of Ecuador. Automotive Section.

Sept. 1922—Rio de Janeiro, Brazil, Automobile exhib-

its in connection with the Brazilian Centenario Asociacion Automobilista Brasileira.

CONVENTIONS

Jan. 17-20, 1922—Chicago, American Road Builders Association.

Jan. 30-31—Chicago, Fifth Annual Convention, N. A. D. A., La Salle Hotel.

Jan. 30-Feb. 2—Boston, Sixth Annual Conference of the International Delivery Association, Copley Plaza Hotel.

May 10-12—Philadelphia, Ninth National Foreign Trade Convention of the National Foreign Trade Council.

June 11-15—Milwaukee, Annual International Convention of the Associated Advertising Clubs of the World.

Sept. 18-23, 1922—Rome, Italy, Second Annual Meeting of the International Chamber of Commerce.

S. A. E. MEETINGS

Detroit, Feb. 24, Mar. 24, April 28, May 26.

New York, Jan. 10-13, 1922—Annual Meeting.

New York, Jan. 16, First Annual Meeting of Advisory Board on Highway Research, Engineering Societies Building.

Chicago, Feb. 1
Minneapolis, Feb. 8-9—Annual Tractor Meeting.

French and Italian Conditions Surveyed

Reports Show Need of Careful Study by American Manufacturers

WASHINGTON, Jan. 4—A survey of automotive production capacity in France and Italy as reported to the automotive division of the Department of Commerce this week shows that there is need for American manufacturers to give careful study to manufacturing conditions in these countries.

According to a report from Commercial Attaché Huntington at Paris:

Prices of motor cars in the French market have dropped but are now well stabilized. However, the prices of French cars are high. Even those of the newly developed 10 hp. vehicles run from \$1,000 to \$2,000 at the present rate of exchange, which is at least twice the cost of a car of equal utility in America. The demand for motor trucks is still low owing to army stocks which glutted the market.

The number of individual manufacturers has increased from 48 before the war to 60 after the armistice. At the present moment they are working only at 20 per cent of their capacity and thus turn out 53,000 cars per annum, which compares with a capacity production of 250,000. The eight hour law now in effect in France, necessitates an average of one year's working time of one man for the production of a chassis, which is evidenced by the fact that for 53,000 cars per annum 55,000 men are employed in the manufacture of chassis and parts, 15,000 on body work and 10,000 on accessories or a total of 80,000 men.

The American consul at Turin, Italy, reports:

Thirteen of the most important Italian automobile manufacturers are located in Turin. Their production is approximately 43 per cent of the normal output, which is accounted for not only by the present economic condition of the home market, but more particularly because of conditions affecting the foreign markets.

Italian automotive manufacturers, when operating their plants at normal, were required to export from 65 per cent to 70 per

cent of their annual output as their home market cannot absorb the total production. The reduced demand abroad, together with high protective tariffs, is chiefly responsible for the curtailment in export shipments. Spain is one of the best markets that has been lost to Italian manufacturers owing to high tariffs.

Perfect-Lite Lighting Set Placed On Market

TWO RIVERS, WIS., Jan. 4—An isolated lighting plant consisting of a single cylinder vertical engine direct-connected to a 1½ kw. generator has been placed on the market by the Perfection Hoist & Engine Co. The engine has cylinder dimensions of 3½ x 4 in., the same as the Ford engine, and the piston rings, connecting rods, valves, springs and tappets are duplicates of Ford parts. Either gasoline or kerosene can be used as fuel. The fuel tank is located in the base and is raised by suction.

The generator armature is mounted on ball bearings and turns at 1150 r.p.m. The slate base switchboard, on top of the generator, has mounted upon it a zero center ammeter, a fuse and the switches. The ignition coil and automatic stop relay are mounted on the back of the board. The generator is wound for either 32 or 110 volts and the set is furnished with storage batteries of several different capacities. The 32-volt outfit with 110 ampere-hour battery sells at \$545.

WICHITA CHANGES NAME

WICHITA FALLS, TEX., Jan. 4—The Wichita Motors Co., manufacturer of the Wichita truck, and the Price-Campbell Cotton Picking Corp. have merged under the name of the Mechanico Agricultural Co., manufacturer of trucks and mechanical cotton pickers.

DODGE HAS FIELD DIRECTOR

DETROIT, Jan. 4—John Nichols, former eastern district representative for Dodge Brothers, has been appointed to the new office of director of field operations. He is studying the used car question as his first job.

Japan May Produce Cars on Large Scale

Plans Depend on Outcome of Washington Conference—Would Use Shipyards

LOS ANGELES, Jan. 3—That the manufacture of automobiles in Japan will be attempted on a large scale along with a number of other lines at present not produced in appreciable quantities, if the proposal to restrict construction of warships is agreed to at the Washington Conference, is the report received from Nipponese industrial centers.

It is declared that plans are already being organized by one of the leading shipbuilding organizations in Japan to convert part of its plant for the production of motor cars, spinning machinery, motors for electric cars, railings for building purposes and telephonic and telegraphic apparatus.

Plans Road Building

With an ambitious road building program being undertaken throughout Japan, the future is believed to hold bright prospects for automobiles in the Empire, and while attempts heretofore made by Japanese companies to manufacture cars and place them on the market have been unsuccessful, the large shipbuilding companies are confident that they can succeed. While the proposed manufacture of motor cars in Japan in the present shipbuilding plants is in merely a discussion stage, it is believed that American automotive experts will be imported to supervise the technical work, if it is undertaken.

E. Matsukata, president of the Kawasaki Dockyard Co., in Kobe, perhaps the greatest shipbuilding plant outside of the naval dockyards in Japan, has been making a tour of inspection of American industries to determine the course to pursue in transforming his big shipbuilding plant into one of an industrial nature, in case the American proposals are adopted.